Welch Allyn®

Atlas™

Operator's Manual

NOTICE

The information in this document is subject to change without notice.

Welch Allyn makes no warranty of any kind on this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Welch Allyn shall not be liable for errors contained herein or for incidental or consequential damages concerning the furnishing, performance, or use of this material.

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Before using this instrument, read this guide and become thoroughly familiar with the contents.

Welch Allyn only considers itself responsible for any effects on safety, reliability and performance of the equipment if:

1 assembly operations, extensions, re-adjustments, modifications or repairs are done by persons authorized by Welch Allyn, and
2 the electrical installation of the relevant room complies with the IEC or national requirements, and
3 the instrument is used according to the instructions for use presented in this manual.

WARNING

Welch Allyn assumes no liability for failures resulting from RF interference between Welch Allyn medical electronics and any radio frequency device at levels exceeding those established by applicable standards.

The use of accessories other than those recommended by Welch Allyn may compromise product performance.

United States Federal law restricts this device to sale by or on the order of a licensed health care practitioner.

Table Of Contents

1 HOW THIS MANUAL WORKS 1

1.1 A QUICK TOUR OF THE WELCH ALLYN ATLAS MONITOR 2

2 MONITORING THE PATIENT 4

2.1 MONITORING BLOOD PRESSURE 6
2.1.1 MAP (Mean Arterial Pressure) 8
2.2 MONITORING SpO_2, PULSE RATE AND THE SpO_2 WAVEFORM 10
2.3 MONITORING HEART RATE AND THE ECG WAVEFORM 13
2.4 MONITORING IMPEDANCE RESPIRATION (MODELS 622XX & 623XX) 16
2.5 MONITORING TEMPERATURE (MODELS 622XX & 623XX) 18
2.6 MONITORING CO_2, RESPIRATION RATE, AND THE $ETCO_2$ WAVEFORM (MODEL 623XX) 20

3 MANAGING THE ALARMS 22

3.1 PATIENT ALARMS 26
3.1.1 Factory Default Patient Alarm Settings 27
3.2 MEASUREMENT INVALID ALARMS 28
3.3 INSTRUMENT PROBLEM ALARMS 29
3.4 BATTERY ALARMS (MODELS 622XX & 623XX) 30

4 CAPTURING AND DISPLAYING TREND DATA 32

5 USING PRINT AND WAVEFORM FREEZE 34

5.1 THE PRINTER – LOADING PAPER AND TROUBLESHOOTING 36

6 CONNECTING TO THE PATIENT 38

6.1 CONNECTING THE NIBP CUFF 40
6.2 CONNECTING THE SpO_2 FINGERCLIP SENSOR 43
6.3 CONNECTING THE ECG ELECTRODES 45
6.4 CONNECTING THE TEMPERATURE PROBE (MODELS 622XX & 623XX) 49
6.5 CONNECTING THE END TIDAL CO_2 SAMPLE TUBE (MODEL 623XX) 50

7 USING THE MENUS 51

7.1 THE SET DATE AND TIME AND OTHER OPTIONS MENU 51
7.2 THE ADVANCED CONFIGURATION MENU 53
7.2.1 Advanced Configuration Menu Settings 55

8 CLEANING AND MAINTAINING THE ATLAS MONITOR 57

9 UNPACKING AND INSTALLING THE ATLAS MONITOR 59

10 APPENDIX A: TECHNICAL SPECIFICATIONS FOR THE ATLAS MONITOR 61

11 APPENDIX B: ELECTROMAGNETIC COMPATIBILITY (EMC) 69

12 APPENDIX C: CALIBRATION AND MAINTENANCE 73

13 APPENDIX D: ACCESSORIES FOR THE WELCH ALLYN ATLAS MONITOR 74

14 APPENDIX E: TROUBLESHOOTING 77

15 INDEX 91

Safety Information

The Welch Allyn Atlas Monitor is intended for use in a hospital or clinical environment. It should not be used at home or in emergency transport vehicles. Monitor users should be skilled at the level of a technician, nurse, doctor or medical specialist.

The function of the Welch Allyn Atlas Monitor is to register ECG, CO_2 concentration, Heart Rate, Noninvasive Blood Pressure (Systolic, Diastolic, and Mean Arterial Pressure), Pulse Oximetry, Respiration Rate and Temperature for adult and pediatric patients (over the age of 3 years), in all hospital or clinic facilities.

To ensure patient electrical isolation, the Atlas Monitor should only be connected to other equipment that provides patient electrical isolation. When connecting the Welch Allyn Atlas Monitor to any instrument, verify proper operation before clinical use. Accessory equipment connected to the monitor's serial data interface must be certified according to IEC Standard 950 for data-processing equipment or IEC Standard 601-1 for electromedical equipment. All combinations of equipment must be in compliance with IEC Standard 601-2 systems requirements. Anyone who connects additional equipment to the signal input / output port is configuring a medical system and is therefore responsible that the system comply with the requirements of IEC Standard 601. If in doubt, consult the Welch Allyn Technical Service Department.

The Welch Allyn Atlas Monitor and its accessories should be tested by qualified service personnel at regular intervals to verify proper operation, according to the procedures of the user's institution. A Service Manual is available from the manufacturer. Other important safety information is located throughout this manual where appropriate.

Warnings, Cautions, and Notes

All operating personnel should be familiarized with the general safety information in this summary. Specific warnings and cautions will also be found throughout the operator's manual. Such specific warnings and cautions may not appear here in this summary.

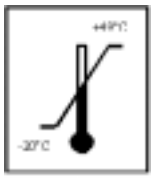
Conforms to IEC 60601-1
UL 2601-1
CAN/CSA C22.2 No 601-1

C US Approved to Australia AS 3200.1, Appendix Z

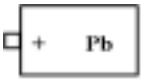
Defibrillator-proof, Type CF Applied Part

Attention, consult accompanying document

Handle with care



Storage temperature. Refer to technical specification for more details.



Lead Acid Battery. For disposal see the Maintenance section of this manual.

Storage humidity. Refer to technical specification for more details.

Warning – Tells you about something that could hurt the patient or hurt the operator.
Caution – Tells you about something that could damage the monitor.
Note – Tells you other important information.

Warnings

- *The Welch Allyn Atlas Monitor is designed for use by medical clinicians. Although this manual may illustrate medical monitoring techniques, this system should only be used by a trained clinician who knows how to take and interpret a patient's vital signs.*
- *Do not operate this product in the presence of flammable anesthetics. Explosion may result.*
- *WARNING – PACEMAKER PATIENTS. Rate meters may continue to count the pacemaker rate during occurrences of cardiac arrest or some arrhythmias. Do not rely entirely upon rate meter alarms. Keep pacemaker patients under close surveillance. See this manual for disclosure of the pacemaker pulse rejection capability of this instrument.*
- *This device must be used in conjunction with clinical signs and symptoms. This device is only intended to be an adjunct in patient assessment. Certain arrhythmias or pacemaker signals could adversely affect heart rate indications or alarms.*
- *During defibrillation, keep the discharge paddles away from ECG and other electrodes, as well as other conductive components in contact with the patient. Avoid contact with any accessories connected to the Welch Allyn Atlas Monitor's panel.*
- *Prolonged use or the patient's condition may require changing the SpO_2 sensor site periodically. Change sensor site and check skin integrity, circulatory status, and correct alignment at least every 4 hours.*
- *When monitoring blood pressure over an extended period of time, or at frequent intervals, it is recommended to check the cuff site and cuffed extremity regularly for possible ischemia, purpura and/or neuropathy.*
- *Thoracic impedance respiration measurement may interfere with some pacemakers. Refer to the pacemaker's manual.*
- *To ensure patient safety, the conductive parts of the ECG electrodes (including associated connectors) and other patient-applied parts, should not contact other conductive parts, including earth ground, at any time.*
- *The safety and effectiveness of this product in the detection of apnea, particularly for infants and neonates, has not been established.*
- *This equipment must not be connected to any other equipment that is not compliant with EN60601-1, or a possibility exists that combined leakage currents could exceed safe limits.*
- *WARNING: Use of accessories, transducers, and cables other than those specified may result in degraded electromagnetic compatibility performance of this device.*
- *Do not operate this product with MRI (Magnetic Resonance Imaging) equipment.*
- *It is the operator's responsibility to set alarm limits as appropriate for each individual patient.*
- *Any Atlas Monitor which has been dropped or damaged should be checked by qualified service personnel to insure proper operation prior to use.*
- *There are no user serviceable parts inside the Atlas Monitor other than paper replacement and battery replacement.*
- *Blood pressure measurements may not be accurate for patients experiencing moderate to severe arrhythmias.*
- *This Atlas Monitor should not be used on patients who are linked to heart / lung machines.*
- *If the integrity of the external protective conductor in the installation or its arrangements is in doubt, equipment shall be operated from its internal power source (models 622xx and 623xx).*
- *If an electrosurgical unit is used, place the ECG cable and wires as far as possible from the site of the surgery and from the electrosurgical cables. This will minimize interference and the risk of burns to the patient. Ensure that the electrosurgical return cable (neutral) is well attached and making good contact with the patient.*

- *End tidal carbon dioxide ($ETCO_2$) and breath rate measurement and alarm capability are active ONLY when the second trace option is set to* **CO_2**. *Should the operator change from viewing the $ETCO_2$ and breath rate waveforms and data to another second trace selection (***SpO_2**, **Respiration** *or* **ECG***) the CO_2 and breath rate monitoring and alarm capability will be disabled. This occurs even if the watertrap and cannula are still inserted into the Monitor.*
- *Impedance Respiration rate measurement and alarm capability are active ONLY when the second trace option is set to* **Respiration**. *Should the operator change from viewing the Respiration waveforms and breath rate to another selection (***SpO_2**, **CO_2** *or* **ECG***) the Respiration rate monitoring and alarm capability will be disabled. This occurs even if the ECG cable is still inserted into the Monitor.*

Cautions

- *Place the Welch Allyn Atlas Monitor and accessories in locations where they cannot harm the patient if they fall off a shelf or mount.*
- *Never place fluids on top of this monitor. In case of fluid spilling on the monitor, disconnect power cord, wipe clean immediately and have the monitor serviced to ensure that no hazard exists.*
- *This Welch Allyn Atlas Monitor should not be stacked directly on top of other equipment, and other equipment should not be stacked on top of this Welch Allyn Atlas Monitor. If stacking is necessary, observe the Welch Allyn Atlas Monitor to verify normal operation in the stacked configuration in which it will be used.*
- *Unplug the external power cord from the monitor before cleaning or disinfecting the monitor.*
- *Do not autoclave, subject to ethylene oxide sterilization, or immerse the Welch Allyn Atlas Monitor in liquid. Sterilize accessories only according to the manufacturer's instructions.*
- *Make frequent electrical and visual checks on cables and electrode wires.*
- *Ensure the AC rating for the device is correct for the AC voltage at your installation site before using the monitor. The AC rating is shown on the back of the instrument. If the rating is not correct, do not use the monitor, and contact the Welch Allyn Technical Service Department for help.*
- *Line isolation monitor transients may resemble actual cardiac waveforms and thus inhibit heart rate alarms. Use care in placement of ECG electrodes and routing of cables to avoid interference and noise.*
- *Electrode polarization: the type of electrode used can affect the recovery time from overload, especially defibrillation. Electrodes of dissimilar metals should not be used.*
- *If the accuracy of any measurement is in question, check the patient's vital sign(s) by an alternate method and then check the Atlas Monitor for proper functioning.*
- *Extremity and cuff motion should be minimized during blood pressure determinations.*
- *The pulse oximeter is calibrated to determine the percentage of arterial oxygen saturation of functional hemoglobin. Significant levels of dysfunctional hemoglobins such as carboxyhemoglobin or methemoglobin may affect the accuracy of the measurement.*
- *Grounding reliability can only be achieved when equipment is connected to an equivalent receptacle marked "Hospital Only" or "Hospital Grade".*

Notes

- *Sidestream waste material and the CO_2 watertrap should be treated as biohazard material.*
- *Blood pressure measurements determined with this device are equivalent to those obtained by a trained observer using the cuff/stethoscope auscultation method, within the limits prescribed by the*

American National Standard, Electronic or automated sphygmomanometers (SP 10).

- *Blood Pressure measurements can be affected by the position of the patient, by the patient's physiological condition, and other factors.*
- *The Blood Pressure system and Temperature system may not meet specifications if operated or stored at conditions outside the stated ranges, or subjected to excessive shock or dropping.*
- *The Blood Pressure system is compliant with requirements of EN 1060-3:1995* Specification for Non-invasive sphygmomanometers.
- *The Atlas Monitor is designed with protective circuitry and current isolation that eliminates any risk to the patient from possible software errors.*

Product Warranty Information

Welch Allyn warrants the Welch Allyn Atlas Monitor, when new, to be free of defects in material and workmanship and to perform in accordance with manufacturer's specifications for a period of two years from the date of purchase from Welch Allyn or its authorized distributors or agents. (Pulse oximetry sensors and temperature probes are warranteed for one year). Welch Allyn will either repair or replace any components found to be defective or at variance from the manufacturer's specifications within this time at no cost to the customer. It shall be the purchaser's responsibility to return the instrument to Welch Allyn or an authorized distributor, agent, or service representative. This warranty does not include breakage or failure due to tampering, misuse, neglect, accidents, modification or shipping. This warranty is also void if the instrument is not used in accordance with manufacturer's recommendations or if repaired by other than Welch Allyn or an authorized agent. Purchase date determines warranty requirements. No other express warranty is given.

Return the Instrument Registration Card

Remember to submit the instrument registration card for warranty validation. Complete the information and mail the pre-addressed card to Welch Allyn. You may also register on-line at <http://www/welchallyn.com/medical/support/warranty>.

Service Information: Service Policy

All service and repairs must be performed by authorized Welch Allyn personnel or agents, using approved Welch Allyn replacement parts and approved process materials. Failure to do so will invalidate the product warranty. Please refer to the product warranty for specific coverage.

Service Information: Technical Assistance

If you have an equipment problem that you cannot resolve, call the Welch Allyn Service Center nearest you for assistance. Technical service support is available to you by telephone on normal business days at the phone numbers listed below.

If you are advised to return a product to Welch Allyn for service or repair, schedule the repair with the service center nearest you.

Before returning a product for repair you must obtain authorization from Welch Allyn. An RMA (Return Materials Authorization) number will be given to you by our service personnel. Be sure to note this number on the outside of your shipping box. Returns without an RMA number will not be accepted.

Service Information

For Technical Support or to obtain return instructions, please contact your nearest Welch Allyn service center listed below:

Welch Allyn, Inc.
4341 State Street Road
Skaneateles Falls, NY 13153-0220
Phone: 1-800-535-6663
Fax: 315-685-4653

Welch Allyn, Ltd. - Canada
160 Matheson Blvd. E., Unit #3
Mississauga, Canada L4Z 1V4
Phone: 905-890-0004
Fax: 905-890-0008

Welch Allyn, Ltd. - UK
Aston Abbots, Buckinghamshire
England HP22 4ND
Phone: 011-44-1296-689905
Fax: 011-44-1296-682104

Welch Allyn, GmbH - Germany
Zollerstrasse 2-4
D72417 Jungingen, Germany
Phone: 011-49-7477-9271-73
Fax: 011-49-7477-9271-93

Welch Allyn, Ltd. - Singapore
6001 Beach Road #21-09
Golden Mile Tower
Singapore 199589
Phone: 011-65-291-0882
Fax: 011-65-291-5780

Welch Allyn, Ltd. - Australia
PO Box 864
Ground Floor, 18-20 Orion Road
Lane Cove, NSW 2066, Australia
Phone: 011-61-294-183-155
Fax: 011-61-294-183-650

CLINICAL SUPPORT

For clinical questions about Atlas Monitor call the Welch Allyn Clinical Support line at 800-769-4014 Extension 3225 or 315-685-4100 Extension 3225.

The CE Mark on this product indicates it has been tested to and conforms with the provisions noted with the 93/42/EEC Medical Device Directive.

European contact for regulatory compliance:
European Regulator Manager
Welch Allyn LTD.
Navan, Co, Meath
Republic of Ireland
Phone 353-46-79060
Fax: 353-46-27128

Service Information: Service Manual / Spare Parts

A service manual is available by request to qualified electronics personnel. The service manual is a comprehensive guide to troubleshooting, service and repair of the Welch Allyn Atlas Monitor.

A complete spare parts price list is available upon request. Spare parts may be ordered from your local Welch Allyn Service Center.

Service Information: Service Loaners

Service loaners are provided, on request, when repair service is provided by a Welch Allyn Service Center. Loaners for products repaired while under the original warranty, or while under extended warranty or service contract, are provided free of charge and are shipped within 48 hours of notification of need. Shipment charges to the user are paid by Welch Allyn.

For service repairs outside of warranty or contract, loaners will be available for a nominal charge and will be shipped subject to availability. Loaners will be shipped pre-paid.

1 How This Manual Works

This manual is arranged so that everything about one topic is found in a single section. The statement immediately below the chapter title (like this one) appears in italics and presents the important points of the topic. Most topics include an illustration or a table. The chapters are numbered so that logically connected topics begin with the same number-- for example 2.1 and 2.2.

The Welch Allyn Atlas Monitor and this manual are designed for ease of use. Everything you need to know about a specific operation of the monitor is available in one place. This means you can see all the required information at a glance.

Redundancy - There is some redundancy in this manual; some step-by-step procedures are repeated in many places wherever they are pertinent. We did this so you would not have to search through other pages to find what you need to know "right now."

For instance, setting an alarm limit is fully explained in the section on blood pressure, again in the section on SpO_2, and in several other places.

Paragraphs - The statement in *italics* immediately below the chapter heading describes what the section is about. Sometimes just reading this and looking at the illustrations will give you enough information.

Section Numbers - The double numbered pages indicate the relationship between the main subject and closely related topics.

The sections are organized so that what you want to know first is put first. Like most medical professionals who use the Atlas Monitor, you are probably very adept at taking blood pressure and connecting ECG leads to patients, so the section on how the Atlas Monitor is used for monitoring patients and what you need to know to operate the monitor comes first. We put the information on connecting blood pressure cuffs and ECG leads in a later section.

This manual is not meant for reading straight through, like a book, although you can read it that way. If you read it like this, the built-in redundancy may become a little tedious. When your read a paragraph or a step-by-step procedure with which you are already familiar, just skip it. It is there for the person who is doing the activity for the first time.

1.1 A Quick Tour of the Welch Allyn Atlas Monitor

When you turn on the power, the monitor starts with preset or default alarm levels. Waveforms are displayed on the screen. Readings are displayed on the screen and on LEDs. You can perform the most common operations — set and silence alarms, display trend data, print waveforms and trend data — from the front panel without using a menu. This section gives only a brief overview of the monitor; later sections present all the details.

Which model do you have? The Welch Allyn Atlas Monitor is a single, portable unit providing all the measurement capability normally needed to monitor patients under anesthesia, patients recovering from surgery, and patients who require bedside monitoring. The model number is encoded into the first three digits of the serial number on the back of the unit. There are three models:

Model	Features
621SO 621SP	SpO_2, SpO_2 waveform Pulse Rate NIBP: Systolic, Diastolic, MAP ECG waveform, heart rate Printer (optional)
622SO 622SP 622NO 622NP	All features of model 621xx, plus: Impedance Respiration Patient Temperature Battery Operation PC Communication Remote Nurse Call Printer (optional)
623SP 623NP	All features of model 622xx, plus: End Tidal CO_2 and Breath Rate from $ETCO_2$ Printer (standard)

Power on - The **Power On/Standby** button is in the lower right corner. When you first turn on the monitor:

- all alarms are enabled, but no alarm will sound until after a valid measurement value is received.
- all alarm limits are set at their default values.
- all the trend data (history) is cleared.

A lit **AC~** indicator, located below the screen, means the unit is being powered by the wall outlet, and that the battery is being charged (models 622xx and 623xx).

Silencing Alarms - You can silence any alarm for 90 seconds by pressing the large blue **Silence** button on the right-hand edge of the instrument. Silenced alarms continue to flash, as long as the measurement is outside the alarm limits.

You can suspend an individual alarm by pressing its **ALARM Off** button. There are four **ALARM Off** buttons, each controlling a different group of measurements. The audible alarm is suspended as long as the red LED in the button is lit. When an alarm is suspended, the audible alarm will not sound, but readings will still flash when the measurement is outside the limits.

Trend Data - Trend data is captured every time blood pressure is measured, whether this event is automatic or manual. Trend data is also automatically captured every 15 minutes if blood pressure intervals are longer, or blood pressure is not used. Push the **Trend** button to see the trend data. Scroll through the trend data with either **Set** button. Push **Trend** again to return to the waveform display. The monitor will hold up to 144 lines of trend data, which is 36 hours if data is captured every 15 minutes.

Printing - A **printer** option is available with both models 621xx and 622xx, and is a standard model 623xx feature. Push the **Print** button to print what is on the screen. If the waveforms are displayed on the screen, the **Print** button prints 15 seconds

of waveforms plus all the current measurements. The printout captures data from 9 seconds before the **Print** button was pressed until 6 seconds after. If trend data is displayed on the screen, **Print** prints all the trend data.

If your model of the Atlas Monitor does not have the optional printer, the **Print** button is labeled **Freeze**, and it freezes, or halts, the waveform display for 10 seconds to permit studying of the waveform.

2 Monitoring the Patient

The patient's vital measurements are displayed as numeric readings and as waveforms. You can set the measurement limit alarm levels, silence the alarms for a short period, and suspend individual alarms. You can print waveforms and current measurements, or print all the stored trend data.

The front panel has two sides:

The left side displays waveforms, numeric readings, and trend data on a CRT screen.	The right side has measurements displayed in green and red LEDs.

Each side responds to the adjacent **Select** and **Set** buttons used for setting alarm limits. Each side also has **ALARM Off** buttons, which are used to suspend (turn off) individual alarms.

Note: The temperature measurement does not have an alarm.

Setting alarm limits - Press the **Select** button to choose which alarm limit you want to set. Each time you press the **Select** button, it cycles to the next alarm, shown by small **HI** and **LO** indicators, and the measurement display flashes the current alarm setting. The **Set** button changes this alarm limit. Press the top or bottom of the button to change the limit up or down.

Note: the flashing alarm setting mode only lasts 10 seconds before reverting back to the normal measurement mode. If you take too long to set a limit, you'll need to press the **Select** button and start over again.

Press the **Select** button to go to the next measurement alarm. Press it several times to cycle out of all the alarm settings and go back to the normal measurement mode.

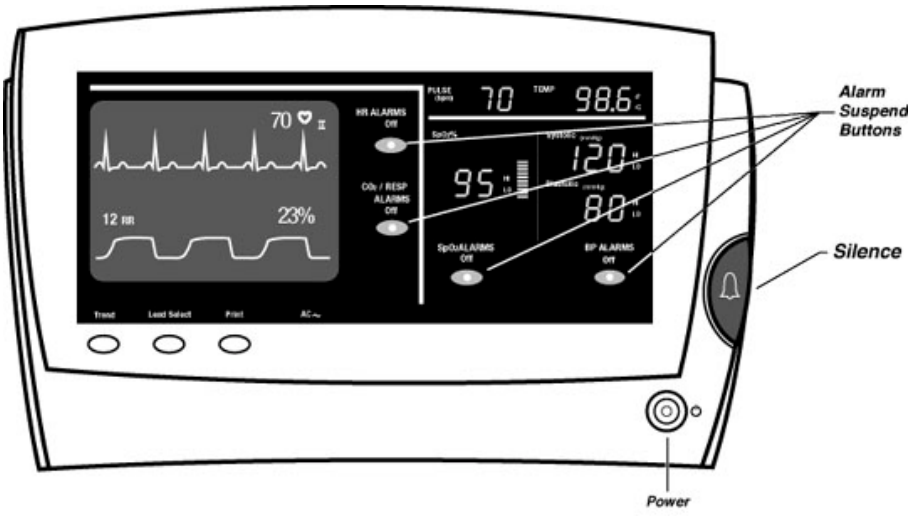
Silencing alarms - The **Silence** button silences all alarms for 60, 90 or 120 seconds. This silence period can be set to one of these three choices in Advanced Configuration. During the silence period, there will be no audible alarms, even for measurements that go outside the limit range for the first time. However, any measurement that is outside the limits you set will flash.

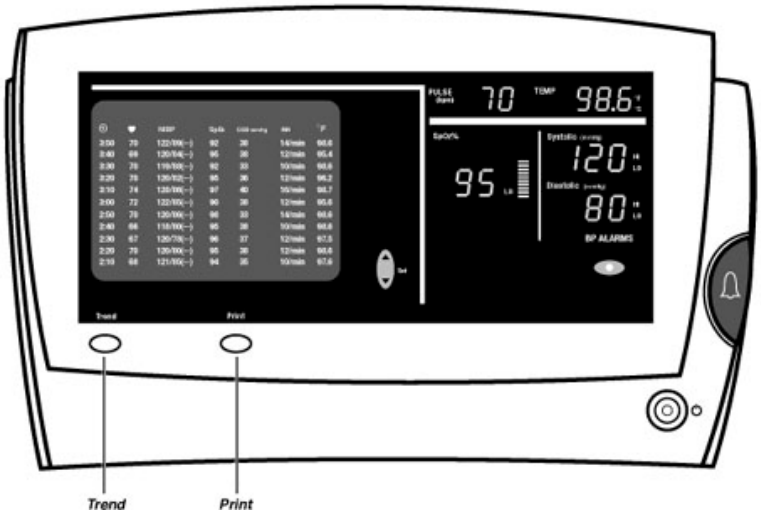
Trend data - Press the **Trend** button to see the trend data. The waveform display is replaced by the first screen of trend data, starting with the most recent measurements at the top. View the rest of the trend data by pressing the **Set** button up or down.

The trend memory can hold up to 144 lines of measurements, which is 36 hours of data if taken at 15 minute intervals.

Printing - The **Print** button prints what you see on the screen - the waveforms (including all current measurements) or the screen with trend data. When you push the button, waveforms are printed starting from 9 seconds before you pushed the **Print** button until 6 seconds after you pushed the button for a total printout of 15 seconds. The other information on the printout is captured at the time that the **Print** button is pressed.

Freeze – If your monitor does not have a printer, the button is labeled **Freeze**. Pressing **Freeze** stops the waveform display for 10 seconds, and then the readout resumes.





Top – Model 623xx showing waveform display and alarm controls

Bottom – Model 623xx showing trend display and associated controls

2.1 Monitoring Blood Pressure

Blood pressure can be measured at timed intervals which you set, or you can start the blood pressure measuring cycle manually. Systolic and Diastolic readings are shown on the LEDs at the upper right of the monitor. You can set the high and low alarm limits for both the systolic and diastolic measurements.

Blood pressure cycles - You can measure NIBP at timed intervals or manually. To set a timed interval, press the **Auto** button to cycle through the available intervals: **X, 1, 3, 5, 10, 15, 30,** or **60** minutes. Wait until the number for the selected interval stops flashing; the measurement will automatically begin 20 seconds later.

Note: The interval is timed from the start of one BP cycle to the start of the next cycle.

Pressing the button one more time after the **60** is lit will return the **Auto** timing to the Off mode (indicated by an "**X**"). In this mode, automatic measurement at timed intervals will not occur. Initially, both blood pressure displays will be blank.

Stopping a blood pressure cycle - The **BP Start/Cancel** button does one of two things:

- If a blood pressure measurement is not in progress, pressing **BP Start/Cancel** will start a blood pressure measurement cycle, whether the **Auto** timer is set to a specific interval or is off.
- If a blood pressure measurement is in progress, pressing **BP Start/Cancel** will deflate the cuff immediately and cancel the measurement. If the **Auto** button is in one of the timed modes, the cuff will inflate again after the selected number of minutes.

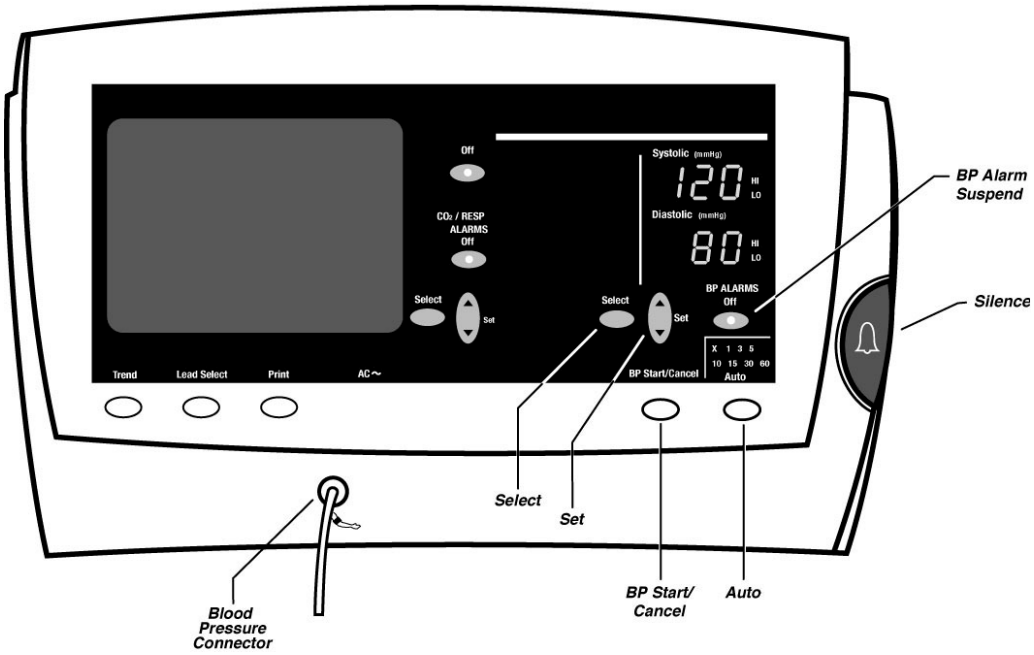
Note: Canceling a blood pressure cycle does not end automatic BP timing. If the **Auto** is set to any number, the next blood pressure cycle will start again after that number of minutes have elapsed.

Alarms - When any of the blood pressure limits are exceeded, an audible alarm sounds and the affected measurement flashes. You can silence this alarm, and all alarms, by pressing the large blue **Silence** button at the right side of the instrument. This will silence all alarms for 60, 90, or 120 seconds, depending on the setting selected in Advanced Configuration. However, any measurement still outside the set limits will flash.

To *suspend* the blood pressure alarms, press the **BP ALARMS Off** button so the red LED in the button lights. A suspended alarm will still flash if it goes outside the range of the limits, but it will not sound the audible alarm.

Trend data – Trend data is captured at each blood pressure cycle, whether it is started automatically or manually. If the **Auto** timing of NIBP is off (**X**), or greater than **15**, then trend data is captured every 15 minutes.

Initial pressure – The initial cuff pressure can be set in the Advanced Configuration. The Atlas Monitor will pump up to the selected initial cuff pressure. If this pressure is too low to measure the systolic pulse, the system will repeatedly increase pressure by 40 mmHg and measure again.



Atlas Monitor showing NIBP displays, controls and tubing connector

Setting alarm limits - To set the Systolic and Diastolic alarm limits, use the **Select** and **Set** buttons on the right side of the monitor to follow these steps:

- Press the **Select** button to cycle through SpO_2 **LO**, then Systolic **HI** and **LO**, and Diastolic **HI** and **LO**.
- Each push of **Select** moves you to the next limit. Stop at the limit you want to set. The measurement and the **HI** or **LO** LED will flash, indicating which limit is being changed.
- Press the **Set** button up or down to raise or lower the alarm limit. (When you come to the end of the range, the numbers will stop changing).
- Press the **Select** button again to go to the next limit, or press it several times until none of the measurements flash and no **HI** or **LO** LEDs are lit. The instrument is now in its normal measurement mode. (If you do not press any button for 10 seconds, the instrument will automatically revert to its normal measurement mode).

2.1.1 MAP (Mean Arterial Pressure)

Mean Arterial Pressure is calculated from the systolic and diastolic measurements. MAP may be optionally displayed by selecting it on the Advanced Configuration menu. MAP is displayed in the upper left corner of the screen.

MAP - (Mean Arterial Pressure) display can be turned on and off by using the Advanced Configuration menu. When MAP is shown, you will see it in the upper left corner of the screen, above the ECG waveform.

To display (or turn off) MAP, enter the Advanced Configuration menu:

- Press the **Date/Time** button.
- Press the **Trend** button.
- Use the left **Select** button to highlight "**MAP**."
- Press the left **Set** to choose "**Yes**" or "**No**."
- Press the **Trend** button again to exit Advanced Configuration.

If MAP is displayed on the screen, it will also appear in the trend data and in the current readings of a waveform printout.

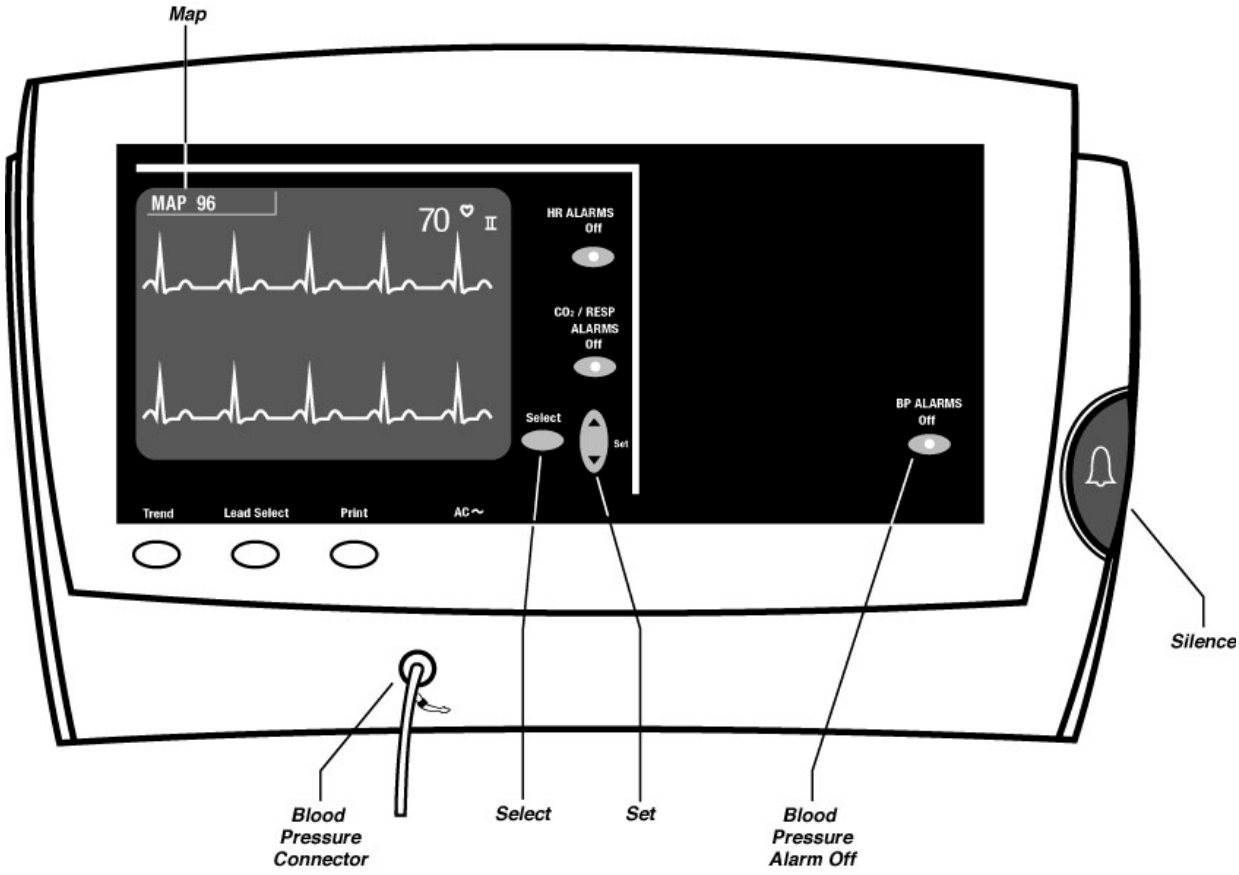
Alarms - When either of the MAP limits are exceeded, an audible alarm sounds and the affected measurement flashes. You can silence this alarm, and all alarms, by pressing the large blue **Silence** button at the right side of the instrument. This will silence all alarms for 60, 90, or 120 seconds, depending on the setting selected in Advanced Configuration. However, any measurement still outside the set limits will flash.

To *suspend* the MAP alarm, press the **BP ALARMS Off** button so the red LED in the button lights. A suspended alarm will still flash if it goes outside the range of the limits, but it will not sound the audible alarm.

Note: MAP is calculated mathematically from the Systolic and Diastolic pressures; it is not measured directly.

Setting alarm limits – If MAP is displayed, you can set the alarm limits, using the **Select** and **Set** buttons on the left side of the monitor to follow these steps:

- Press the left **Select** button to cycle through MAP **HI** and **LO**, Heart Rate **HI** and **LO**, Respiration **HI** and **LO** (models 622xx or 623xx) , then (model 623xx) CO_2 **HI** and **LO**.
- Each push of **Select** moves you to the next limit. Stop at the limit you want to set. The measurement and **HI** or **LO** will flash, indicating which limit is being changed.
- Press the **Set** button up or down to raise or lower the alarm limit. (When you come to the end of the range, the numbers will stop changing).
- Press the **Select** button again to go to the next limit, or press it several times until none of the measurements flash and no **HI** or **LO** indicators are lit. The instrument is now in its normal measurement mode. (If you do not press any button for 10 seconds, the instrument will automatically revert to its normal measurement mode).



Atlas Monitor waveform display showing location of MAP reading

2.2 Monitoring SpO_2, Pulse Rate and the SpO_2 Waveform

The oximetry and pulse rate measurements are generally taken with the reusable fingerclip sensor (provided), however a wide variety of SpO_2 sensors are available as accessory items. The oximetry pulse volume is displayed as a vertical bar graph, called the Plethysmograph, beside the SpO_2% display on the right side of the monitor. The SpO_2 pulse tone gives an audible indication of pulse rate and oxygen level.

Pulse - A fingerclip sensor provides the source of the light transmitted through the patient's finger to determine the oximetry and pulse rate measurements. The green Pulse Rate numbers may sometimes differ slightly from the Heart Rate displayed over the ECG waveform, even though they both measure beats per minute (bpm). This is normal.

Oxygen level - The oxygen level is displayed in red numbers as a percentage. The Plethysmograph vertical bar graph next to the SpO_2 percentage shows the strength of the fingerclip sensor signal with each beat. If this signal is low, it could indicate that the fingerclip sensor is not placed properly, or that the patient has poor perfusion. Pigmented skin and nail polish can also lower the signal.

System Displays – The system will begin displaying the Plethysmograph signal almost immediately upon attachment of the fingerclip sensor to the patient. The SpO_2 level and Pulse Rate will be displayed within about 5 seconds, after the system determines that the reading is stabilized.

Second waveform - The pulse oximetry waveform can be selected as a second trace. If this is chosen, the bottom line of the screen displays the SpO_2 waveform. Select the Second trace source from the Advanced Configuration menu.

Pulse tone - A short SpO_2 tone sounds with every pulse beat.

- The pulse tone *timing* is based on the ECG heart rate. If ECG is not used, the pulse tone timing is based on the SpO_2 measurement.
- The pulse tone *pitch* is determined by the oxygen level, increasing in frequency (pitch) as the percentage of oxygen elevates.

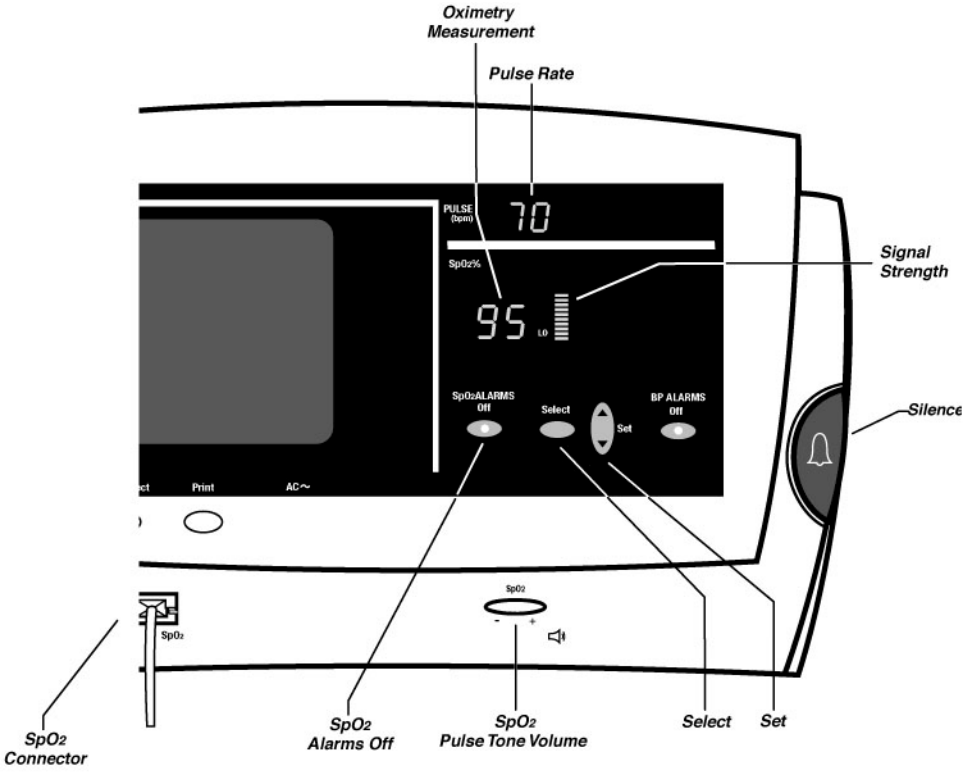
The pulse tone *volume* can be controlled by a button on the lower right panel. The button is below the SpO_2 display, labeled with a speaker icon and **SpO_2**.

Note: The pulse tone volume *can* be turned completely off with this button.

Note: If the SpO_2 is inactive, the timing of the SpO_2 pulse tone is in synchrony with the ECG heart rate as is normally the case, but the pitch of the tone is steady, unvarying, and different from the tone tracking oxygen content.

Alarms - When the oxygen percentage falls below the SpO_2 limit, an alarm sounds and the affected measurement flashes. You can silence this alarm, and all alarms, by pressing the large blue **Silence** button at the right side of the instrument. This will silence all alarms for 60, 90, or 120 seconds, depending on the setting selected in Advanced Configuration. However, any measurement still outside the set limits will flash.

To *suspend* the SpO_2 alarm, press the **SpO_2 ALARMS Off** button so the red LED in the button lights. A suspended alarm will still flash if it goes outside the range of the limits, but it will not sound the audible alarm.



Atlas Monitor showing SpO_2 displays, controls, and sensor connector

Setting alarm limits - To set the SpO_2 alarm limits, use the **Select** and **Set** buttons on the right side of the monitor to follow these steps:

- Press the **Select** button to cycle through SpO_2 **LO**, then Systolic **HI** and **LO**, and Diastolic **HI** and **LO**.
- Each push of **Select** moves you to the next limit. Stop at the limit you want to set. The measurement and the **HI** or **LO** LED will flash, indicating which limit is being changed.
- Press the **Set** button up or down to raise or lower the alarm limit. (When you come to the end of the range, the numbers will stop changing).
- Press the **Select** button again to go to the next limit, or press it several times until none of the measurements flash and no **HI** or **LO** LEDs are lit. The instrument is now in its normal measurement mode. (If you do not press any button for 10 seconds, the instrument will automatically revert to its normal measurement mode).

Pulse and Heart Rate alarms - There is one case where the Heart Rate alarm receives status information from the Oximeter pulse rate:
If ECG is inactive and the Heart Rate is shown as dashes, the Heart Rate alarm is triggered by the Pulse rate instead of the ECG Heart Rate.
If the Pulse rate falls outside the Heart Rate limits, the Pulse measurement flashes and the alarm sounds. Use the large blue **Silence** button to temporarily silence the alarm, and use the **SpO_2 ALARMS Off** button to suspend it.

Saving volume settings – You can save your volume settings for alarms and for pulse tone after you change them, so that they become the initial settings every time the Atlas Monitor is powered on. After making the alarm and pulse volume changes, press **Date/Time** to display the Other Options menu, and press **Print** (or **Freeze**) to save your settings. Press **Date/Time** to return to the main screen. You may repeat this whenever you want to change your settings.

2.3 Monitoring Heart Rate and the ECG Waveform

The trace displays one of the ECG leads. This lead is indicated above the right end of the trace, near the ♥ symbol and heart rate value. Choose the lead with the **Lead Select** *button. Heart rate is displayed at the right.*

ECG displays – The ECG waveform is always displayed on the upper half of the screen. The ECG waveform cascades (continues) from the upper half of the screen to also appear at the bottom portion when other waveforms are not selected in Advanced Configuration. The Heart Rate is displayed above the right end of the top waveform, near the ♥ symbol. The symbol for the selected ECG lead is shown to the right of the Heart Rate.

There is always a scale reference bar shown to the left of the upper ECG waveform. This scale bar has a height that represents a 1 mV signal. The apparent height of the scale bar will vary depending upon the ECG gain setting being used, but will always correspond to a 1mV signal.

Selecting leads - Press **Lead Select** to change the lead display. The ECG function can use either 3 wire leads - **I, II, III** , or 5 wire leads - **I, II, III, aVR, aVL, aVF**, and **V.** 3 wire or 5 wire lead setting is selected in the Advanced Configuration menu.

Note: When using 3 wire leads, the **ECG lead set** must be set correctly. Incorrect results and noisy waveforms can be obtained if the system is configured for 5 wire leads when using 3 wire leads.

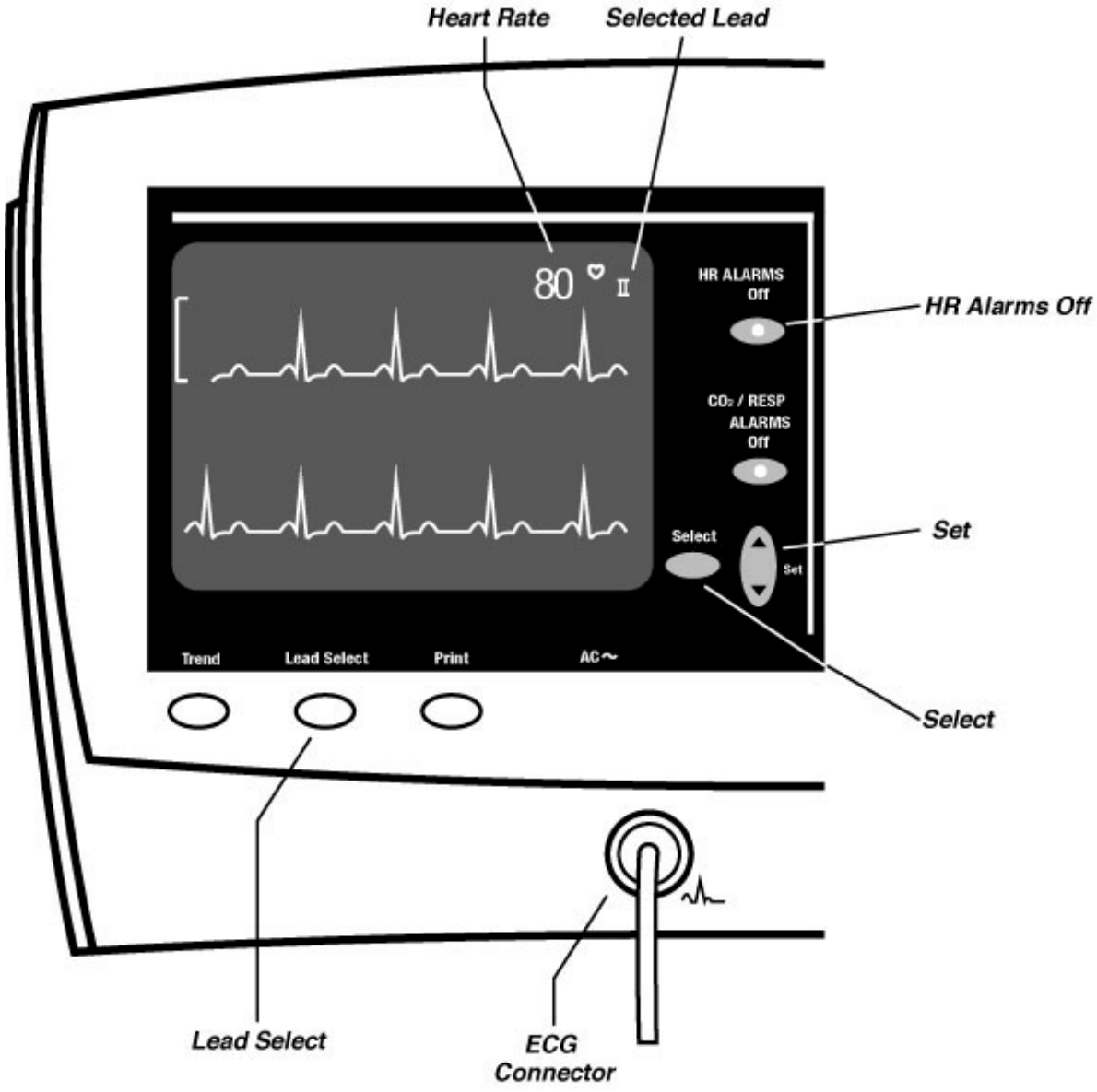
Alarms - When either of the Heart Rate limits are exceeded, an audible alarm sounds and the affected measurement flashes. You can silence this alarm, and all alarms, by pressing the large blue **Silence** button at the right side of the instrument. This will silence all alarms for 60, 90, or 120 seconds, depending on the setting selected in Advanced Configuration. However, any measurement still outside the set limits will flash.

To *suspend* the Heart Rate alarms, press the **HR ALARMS Off** button so the red LED in the button lights. A suspended alarm will still flash if it goes outside the range of the limits, but it will not sound the audible alarm.

If ECG is inactive for any reason, the Heart Rate display will be dashes "---" and the Heart Rate alarm will respond to the pulse oximetry rate.

Setting alarm limits –To set the Heart Rate alarm limits, use the **Select** and **Set** buttons on the left side of the monitor to follow these steps:

- Press the left **Select** button to cycle through MAP **HI** and **LO**, Heart Rate **HI** and **LO**, Respiration **HI** and **LO** (models 622xx or 623xx) , then (model 623xx) CO_2 **HI** and **LO**.
- Each push of **Select** moves you to the next limit. Stop at the limit you want to set. The measurement and **HI** or **LO** will flash, indicating which limit is being changed.
- Press the **Set** button up or down to raise or lower the alarm limit. (When you come to the end of the range, the numbers will stop changing).
- Press the **Select** button again to go to the next limit, or press it several times until none of the measurements flash and no **HI** or **LO** indicators are lit. The instrument is now in its normal measurement mode. (If you do not press any button for 10 seconds, the instrument will automatically revert to its normal measurement mode).



Atlas Monitor showing ECG waveform display, controls, and ECG connector

ECG settings in Advanced Configuration - The five settings in the Advanced Configuration menu associated with the ECG are listed in this table:

Advanced Configuration	
ECG setting	**Possible values**
ECG gain	automatic | 10 mm/mV
ECG lead set	3 wire | 5 wire
ECG speed	6.25 | 12.5 | 25 mm/s
ECG bandwidth	Monitor | Extended
Second trace selection	ECG | SpO_2 | Respiration | CO_2

You can change the ECG settings in Advanced Configuration:

- Press the **Date/Time** button.
- Press **Trend.**
- Use either **Select** button to highlight **ECG gain**, **ECG lead set** , **ECG speed**, **ECG bandwidth,** or **Second trace selection**.
- Use the **Set** button to change any of these values.
- Press **Trend** to exit Advanced Configuration

ECG gain - The height of the vertical ruler that appears to the left of the ECG waveform indicates a 1 mV amplitude and is 10 mm high if **10 mm/mV** gain is chosen. When **automatic** gain is selected the ruler height will vary, but it will always indicate a 1 mV signal size. The ruler size is automatically increased or decreased to scale to a particular set of waves, but the vertical line still indicates the same amplitude of 1 mV.

ECG lead set - The Atlas Monitor allows for both **3 wire** and **5 wire** ECG lead sets.

Note: When using 3 wire leads, the **ECG lead set** must be set correctly. Incorrect results and noisy waveforms can be obtained if the system is configured for 5 wire leads when using 3 wire leads.

ECG speed - The amount of ECG waveform shown on the CRT is determined by the trace speed. A slower trace speed means more seconds of waveform are shown on the CRT.

ECG bandwidth - The ECG waveform can be displayed and printed in either **Monitor** or **Extended** bandwidth. **Monitor** mode allows for a clearer picture of the waveform by filtering out noise. **Extended** mode, usually used with cardiac paced patients, shows the finer nuances of ECG waveform, facilitating the detection of conditions such as ischemia.

Note: Detection of ischemia is the interpretation of the clinician only, the Atlas Monitor does not provide automated ischemia detection.

Note: It is normal for the ECG baseline to wander slightly in **Extended** bandwidth.

Pacemaker signals – The Atlas Monitor displays pacemaker signals exactly as they are captured. There is no option to display symbolic pace indications. Use **Extended** bandwidth for enhanced display of pacemaker signals.

2.4 Monitoring Impedance Respiration (Models 622xx & 623xx)

The lower trace can display the Impedance Respiration waveform if this is chosen in Advanced Configuration. In this case, the Respiration Rate is displayed above the right side of the waveform. The Impedance Respiration waveform is always derived from Lead I (RA-LA).

What is it? - Respiration Rate is measured with the ECG leads. As the chest expands and contracts during the respiration cycle, the resistance, or impedance, between the RA-LA electrodes (**Lead I**) changes. The result of these changes indicates the respiration rate.

For best performance in monitoring impedance respiration rate, change the LA and RA electrode placement to the mid-axillary line on each side of the chest as shown in the section on connecting the ECG.

Where is it? - In Atlas Monitor model 622xx, the lower trace normally shows cascading ECG. In Atlas Monitor model 623xx, the lower trace normally displays the $ETCO_2$ waveform. However, the lower trace can instead show Impedance Respiration, if it is chosen in Advanced Configuration.

How to display it – You can change the **Second trace selection** settings in Advanced Configuration:

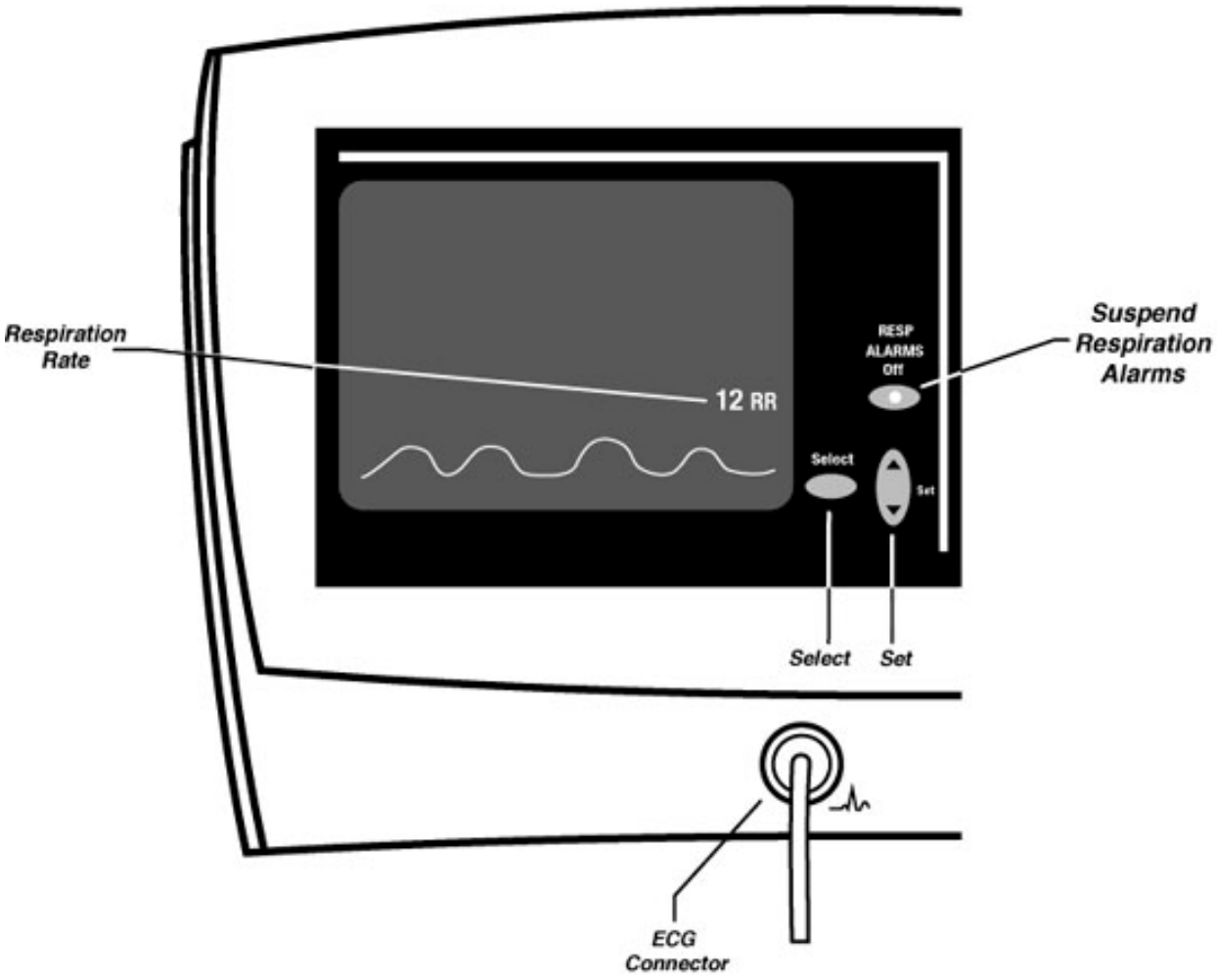
- Press the **Date/Time** button.
- Press **Trend.**
- Use either **Select** button to highlight **Second trace selection**.
- Use either **Set** button to choose **Respiration** from the choices **ECG, SpO_2, Respiration, CO_2** (model 623xx).
- Press **Trend** to exit Advanced Configuration.

Impedance Respiration is sensitive to patient movement, making it less accurate than $ETCO_2$ for measuring the breath rate. For this reason, model 623xx users often prefer to view the $ETCO_2$ waveform and let the monitor measure breath rate from this source.

Alarms - When either of the respiration rate limits are exceeded, an audible alarm sounds and the affected measurement flashes. You can silence this alarm, and all alarms, by pressing the large blue **Silence** button at the right side of the instrument. This will silence all alarms for 60, 90, or 120 seconds, depending on the setting selected in Advanced Configuration. However, any measurement still outside the set limits will flash.

To *suspend* the respiration rate alarms, press the **CO_2/RESP ALARMS Off** (**RESP ALARMS Off)** button so the red LED in the button lights. A suspended alarm will still flash if it goes outside the range of the limits, but it will not sound the audible alarm.

Warning: Impedance Respiration rate measurement and alarm capability are active ONLY when the second trace option is set to **Respiration**. Should the operator change from viewing the Respiration waveforms and breath rate to another selection (**SpO_2**, **CO_2** or **ECG**) the Respiration rate monitoring and alarm capability will be disabled. This occurs even if the ECG cable is still inserted into the Monitor.



Atlas Monitor showing Impedance Respiration waveform display, controls, and ECG connector

Setting alarm limits –To set the Respiration alarm limits, use the **Select** and **Set** buttons on the left side of the monitor to follow these steps:

- Press the left **Select** button to cycle through MAP **HI** and **LO**, Heart Rate **HI** and **LO**, Respiration **HI** and **LO**, then (model 623xx only) CO_2 **HI** and **LO**.
- Each push of **Select** moves you to the next limit. Stop at the limit you want to set. The measurement and **HI** or **LO** will flash, indicating which limit is being changed.
- Press the **Set** button up or down to raise or lower the alarm limit. (When you come to the end of the range, the numbers will stop changing).
- Press the **Select** button again to go to the next limit, or press it several times until none of the measurements flash and no **HI** or **LO** indicators are lit. The instrument is now in its normal measurement mode. (If you do not press any button for 10 seconds, the instrument will automatically revert to its normal measurement mode).

2.5 Monitoring Temperature (Models 622xx & 623xx)

The Temperature, measured on the skin surface with a skin sensor, is displayed in ℉ or ℃, as chosen in Advanced Configuration. There are no audible alarms for Temperature. An invalid temperature reading is indicated by dashes "---" in the numeric display.

Temperature can be measured with a skin sensor.

No alarms – There are no temperature alarm limits and no audible alarms for temperature. If there is no temperature probe connected when the monitor is first turned on, the TEMP display will be blank.

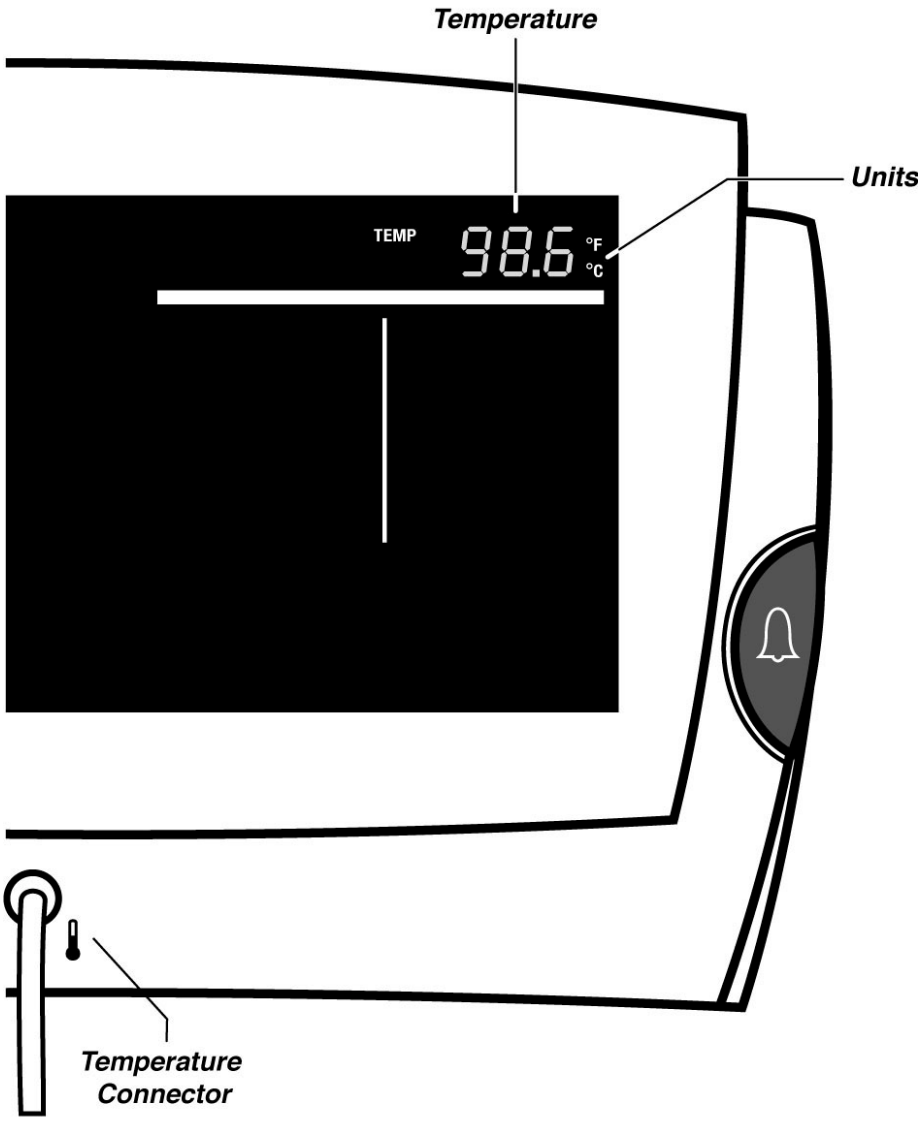
If the probe becomes disconnected from the patient or the monitor, the TEMP display will show steady dashes "---", but there will be no alarm.

Changing the scale – The temperature display can be in °F or °C, as selected in Advanced Configuration.

You can change the **Temperature units** setting in Advanced Configuration:

- Press the **Date/Time** button.
- Press **Trend.**
- Use either **Select** button to highlight **Temperature units**.
- Use either **Set** button to choose **°F** or **°C.**
- Press **Trend** to exit Advanced Configuration.

Note: The temperature display is blank at power-on until a temperature probe has been detected.



Atlas Monitor showing Temperature display and connector

2.6 Monitoring CO_2, Respiration Rate, and the $ETCO_2$ Waveform (Model 623xx)

The lower trace displays the $ETCO_2$ waveform, although you can display Impedance Respiration, ECG, or SpO_2 in its place if desired. The CO_2 measurement is shown above the right end of the trace, and Respiration Rate appears on the left. You can set alarm limits for both of these measurements.

What is displayed – In the Atlas Monitor model 623xx, one of the lower trace alternatives to the cascading ECG includes the CO_2 waveform. The Respiration Rate is displayed above the left end of this trace. Carbon Dioxide concentration is displayed above the right end of the trace. CO_2 can be displayed in units of **%**, **mmHg**, or **kPa**. There are high and low alarm levels for Respiration Rate and for CO_2 concentration.

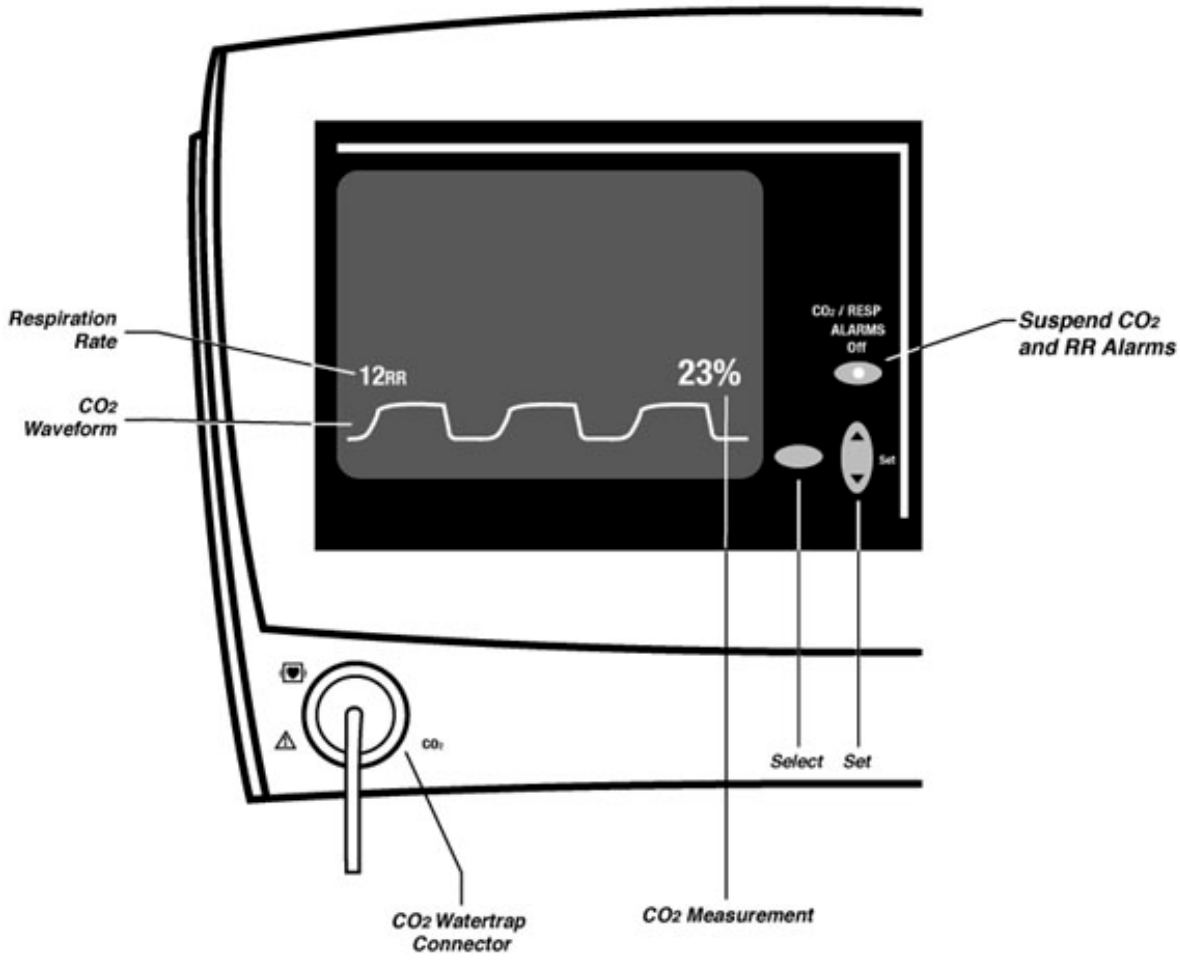
Note: the watertrap must be installed for the CO_2 displays to be active. If the watertrap is not installed, the Atlas Monitor will display cascading ECG.

Warning: End tidal carbon dioxide ($ETCO_2$) and breath rate measurement and alarm capability are active ONLY when the second trace option is set to **CO_2**. Should the operator change from viewing the $ETCO_2$ and breath rate waveforms and data to another second trace selection (**SpO_2**, **Respiration** or **ECG**) the CO_2 and breath rate monitoring and alarm capability will be disabled. This occurs even if the watertrap and cannula are still inserted into the Monitor.

How it works - The CO_2 sensor is based on a single beam, single frequency Infra-Red (IR) source and a dual thermopile detector. CO_2 measurement is based on the IR absorption characteristics of CO_2 molecules. The CO_2 sensor uses non-dispersive IR spectroscopy to measure the number of CO_2 molecules present in the sample gas. CO_2 gas has a unique absorption band which is related to a CO_2 molecule's composition and mass. CO_2 gas concentration is measured by detecting absorption in this band. The IR absorption in the CO_2 wavelength band may be affected by a number of factors that skew the CO_2 measurement. The Atlas Monitor automatically compensates for some of these factors. Water vapor compensation accounts for the effect that water vapor has on the IR absorption characteristics of CO_2 molecules. During normal sidestream operation, CO_2 measurements are adjusted mathematically to compensate for this effect.

Alarms - When any of the CO_2 or Respiration Rate limits are exceeded, an audible alarm sounds and the affected measurement flashes. You can silence this alarm, and all alarms, by pressing the large blue **Silence** button at the right side of the instrument. This will silence all alarms for 60, 90, or 120 seconds, depending on the setting selected in Advanced Configuration. However, any measurement still outside the set limits will flash.

To *suspend* both the CO_2 and Respiration Rate alarms, press the **CO_2/RESP ALARMS Off** button so the red LED in the button lights. A suspended alarm will still flash if it goes outside the range of the limits, but it will not sound the audible alarm.



Atlas Monitor model 623xx showing $ETCO_2$ waveform display, controls, and watertrap connector

Setting alarm limits –To set the CO_2 and Respiration Rate alarm limits, use the **Select** and **Set** buttons on the left side of the monitor to follow these steps:

- Press the left **Select** button to cycle through MAP **HI** and **LO**, Heart Rate **HI** and **LO**, Respiration **HI** and **LO**, then CO_2 **HI** and **LO**.
- Each push of **Select** moves you to the next limit. Stop at the limit you want to set. The measurement and **HI** or **LO** will flash, indicating which limit is being changed.
- Press the **Set** button up or down to raise or lower the alarm limit. (When you come to the end of the range, the numbers will stop changing).
- Press the **Select** button again to go to the next limit, or press it several times until none of the measurements flash and no **HI** or **LO** indicators are lit. The instrument is now in its normal measurement mode. (If you do not press any button for 10 seconds, the instrument will automatically revert to its normal measurement mode).

3 Managing the Alarms

Four types of events can cause an alarm: 1) the patient's measurement is outside the limits you set; 2) the measurement is invalid; 3) the instrument is malfunctioning; 4) the battery is low. You can silence alarms for a period (60, 90, or 120 seconds) by pressing the Silence button, or you can turn off (suspend) the audible signal for any patient alarm or measurement invalid alarm. You can also adjust the alarm volume.

With this monitor, it is easy to set alarm levels, to silence alarms for a short period, and to suspend a selected measurement from triggering the audible alarm.

Alarm types – Three types of events cause an audible alarm:

- A **Patient Alarm** is triggered by a vital measurement registering outside the limits you set. That measurement display will flash and, if the measurement is not suspended or silenced, an audible alarm will sound.
- A **Measurement Invalid Alarm** means the instrument is working properly, but something is wrong with one of the measurements. This could be caused by one of the leads coming off the patient, or by the cable connection to the instrument coming out. This alarm can also mean that the actual patient vital sign is outside of the range of measurement of the Atlas Monitor. These events cause an audible alarm, a message on the screen, and the affected display turns to dashes "---" which flash.
- An **Instrument Problem Alarm** means the instrument has found an internal problem. These alarms are very rare. They produce an audible alarm, a message on the screen, and the affected measurement display will be blank.
- A **Battery Low Alarm** means that the battery (models 622xx and 623xx) is running low and has 10 or fewer minutes of life remaining.

To help you determine what an alarm means, there are four principal alarm sounds. The four alarm types and their visual indications are shown in the table.

Alarm volume – The Alarm Volume is controlled by a button labeled with a bell icon. Eight volume settings are provided.

Note: The alarm volume *cannot* be turned completely off with this button.

Saving volume settings – You can save your volume settings for alarms and for pulse tone after you change them, so that they become the initial settings every time the Atlas Monitor is powered on. After making the alarm and pulse volume changes, press **Date/Time** to display the Other Options menu, and press **Print** (or **Freeze**) to save your settings. Press **Date/Time** to return to the main screen. You may repeat this whenever you want to change your settings.

Nurse Call – All alarms activate the Nurse Call relay through a rear panel connector of models 622xx and 623xx. This relay can be connected to the hospital system to alert the central nurse station. The Nurse Call relay will be activated for any condition that causes an audible alarm at the unit. This means suspended alarms will *not* alert the nurse station, nor will alarms that occur during a silence period, until the period is over. See the Technical Service Manual for details on the Nurse Call relay.

Warning: it is the user's responsibility to implement the interface between the Nurse Call system and the Welch Allyn Atlas Monitor. It is also the user's responsibility to adequately test the interface between the Monitor and the Nurse Call system to ensure

that the desired functionality is operational.

Silencing alarms – You can turn off the audible alarm sound for a brief period by pressing the **Silence** button. The LED will light and no audible alarms will be heard for 60, 90, or 120 seconds, depending on the alarm silence duration.

To set the alarm silence duration, enter Advanced Configuration by pressing **Date/Time**, then pressing **Trend**. Use either **Select** button to highlight **Silence duration**. Press the **Set** button to choose **60, 90** or **120** seconds. Exit by pressing the **Trend** button again.

Pressing the **Silence** button silences *all* alarms, including new alarm events that may occur after you press the button. However, even with no sound, those measurements that are outside their limits will still be noticeable, by the flashing numbers or dashes, or blank displays.

At the end of the silence period, when the LED on the **Silence** button turns off, any measurement still outside its limits will cause another audible alarm.

If you press the **Silence** button during the silence period, while the bell icon is still lit, the silence period ends, and any alarm condition, new or old, will sound the audible alarm.

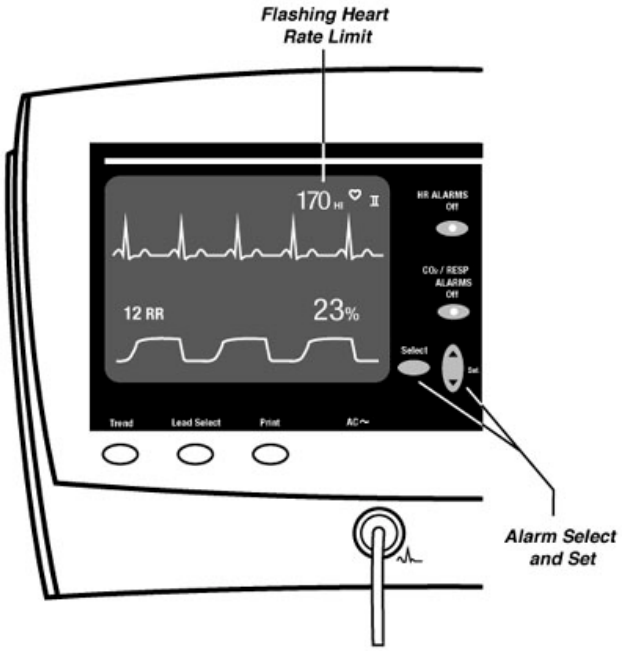
Suspending alarms – Suspending an alarm means preventing a patient measurement from triggering an alarm. Suspended alarms are "off" in the sense that they will not *sound* the alarm, but they are "on" in the sense that the patient's vital signs are still measured and displayed. Suspended measurements flash if they are outside the limits, but they do not cause an alarm sound.
To suspend a measurement alarm, press the appropriate **ALARMS Off** button and the red LED in the center of the button will light. There are 4 **ALARMS Off** buttons, and they suspend the groups of measurements in the following table:

Suspending Alarms	
"Off" button label	**Suspends measurements**
HR ALARMS	Heart Rate
CO_2/RESP ALARMS	$ETCO_2$ and Respiration Rate
SpO_2 ALARMS	Oximetry and Pulse Rate
BP ALARMS	Systolic, Diastolic and MAP

Note: To remove suspension, press the **ALARMS Off** button again. Remember, suspended alarms remain suspended until you press the **ALARMS Off** button again. They do not time out automatically. Alarms are not suspended at power up, but an alarm will not sound until valid measurements have begun.

Alarm Conditions			
Alarm type	**Normal operation**	**Silenced**	**Suspended**
Patient Alarm; a vital sign measurement is outside limits	Numbers flash Audible alarm – medium pitched tone once per second	Numbers flash No audible alarm	Numbers flash No audible alarm
Sensor disconnected from patient	Flashing "---" Audible alarm – high pitched tone twice per second Message on screen	Flashing "---" No audible alarm Message on screen	Solid "---" No audible alarm No message on screen
Measurement outside the range of the instrument	Flashing "---" Audible alarm – high pitched tone twice per second Message on screen	Flashing "---" No audible alarm Message on screen	Solid "---" No audible alarm No message on screen
Temperature probe disconnected*	Solid "---" No audible alarm Message on screen	Solid "---" No audible alarm Message on screen	
Instrument problem	Affected measurement is blank Audible alarm – very high pitched tone, very rapid rate Message on screen	Affected measurement blank No audible alarm Message on screen	Affected measurement blank No audible alarm No message on screen
Battery low	Tone once every 2 minutes Message on screen	No audible tone Message on screen	
Battery very low	Tone once every minute Message on screen	No audible tone Message on screen	

*The temperature display remains blank until a probe is detected for the first time after turning on the monitor.



Atlas Monitor showing alarm setting displays and controls

3.1 Patient Alarms

Patient alarms sound when one of the patient's vital measurements is registering outside the limits you have set. You can set high and low alarm limits for most of the measurements. Setting and checking the alarm limits can be easily done from the front panel. The alarm settings can be saved as defaults by accessing a menu.

A Patient Alarm is a signal that some vital measurement is outside the limits that were set by you. Patient alarm limits assume preset values when the monitor is first turned on and it is easy to change the limits at the front panel.

Setting alarm limits – The front panel of the monitor has 2 sets of **Select** and **Set** buttons. One set is on the right side of the monitor, and one set is on the left side. To set a patient alarm limit, use one of the **Select** buttons and follow these steps:

- Press the **Select** button on the side of the monitor closest to the measurement you want to change several times until the limit you want to change flashes. Successively pressing this button cycles through the settings for each different measurement. These numbers and the **HI** or **LO** indicator will slowly flash. The flashing numbers show the current alarm limit.
- While the alarm limit you want to change is flashing, press the top or bottom half of the **Set** button. This changes the alarm limit.

Note: The alarm limits do not wrap around at the upper and lower end of their legal values. Instead, the number stops changing when you reach the upper or lower measurement limit of the instrument.

- When you are satisfied with this alarm limit, press **Select** again to move to another patient alarm.
- To exit alarm limit setting and return to normal mode, press **Select** until there are no alarm limits or **HI** or **LO** indicators flashing.

Note: If the buttons are not pressed for 10 seconds, the unit will automatically revert to its normal mode.

Silencing patient alarms – The **Silence** button turns off *all* audible alarms - patient alarms and other types - for a short period. Any vital measurement that is outside its limits will flash, showing which measurement is out of range. Any other measurements that go outside their limits during the current silence period will also flash, but will not trigger the audible alarm during the silence period.

Suspending patient alarms – You can suspend patient alarms individually, which means that the specific measurement will not sound the audible alarm when it goes outside the limits. However, this value will still flash whenever it is outside the limits, giving you a visual indication of an alarm condition.

The **ALARMS Off** buttons to suspend alarms are shown in the table:

Suspending Alarms	
"Off" button label	**Suspends measurements**
HR ALARMS	Heart Rate
CO_2/RESP ALARMS (RESP ALARMS)	$ETCO_2$ and Respiration Rate
SpO_2 ALARMS	Oximetry and Pulse Rate
BP ALARMS	Systolic, Diastolic and MAP

Press the appropriate **ALARMS Off** button to

suspend the audible alarm for a selected measurement. The LED in the button will light, indicating that the alarm is off. If this measurement goes outside the set limits, the displayed value will flash. To remove suspension, press the **ALARMS Off** button again and the light will turn off.

Saving alarm settings – You can save your alarm settings after you change them, so that they become the initial settings every time the Atlas Monitor is powered on. After making the alarm limit changes, press **Date/Time** to display the Other Options menu, and press **Print** (or **Freeze**) to save your settings. Press **Date/Time** to return to the main screen. You may repeat this whenever you want to change your settings.

3.1.1 Factory Default Patient Alarm Settings

Measurement	Low alarm default	High alarm default
Heart Rate	45 beats/minute	140 beats/minute
Blood Pressure – Systolic	70 mmHg	200 mmHg
Blood Pressure – Diastolic	50 mmHg	155 mmHg
Blood Pressure – MAP	60 mmHg	180 mmHg
SpO_2	85%	-
Respiration Rate	7 breaths/minute	30 breaths/minute
CO_2	25 mmHg	60 mmHg

3.2 Measurement Invalid Alarms

Invalid measurements could be caused by problems such as an ECG lead detaching from the patient or by a kinked $ETCO_2$ sample line. Such conditions sound an alarm with a tone and pattern distinct from the other alarms. You can quiet these with the Silence button, and you can suspend the alarm with the appropriate **ALARMS Off** *button. A Measurement Invalid alarm could also indicate that the patient's vital sign has exceeded the measurement capability of the Atlas Monitor.*

The Measurement Invalid Alarm is indicated by distinctly different alarm tones and by a message on the screen. A variety of conditions might cause this type of alarm, such as:

- the $ETCO_2$ sample line is kinked.
- one of the ECG leads has fallen off the patient.
- the $ETCO_2$ watertrap is full and must be replaced.
- one of the sensor cables is unplugged from the monitor.
- the blood pressure cuff is detached, has a leak, or is kinked.
- the patient's vital sign measurement is outside the range supported by the instrument.

Any of these Measurement Invalid conditions will cause three things to happen:

- The **audible alarm** will sound, if the event occurs outside a silence period.
- The affected measurement will show **flashing dashes** "---".
- A **message** appears on the screen.

Silencing alarms – You can silence the audible alarm with the **Silence** button for a short period. This will *not* erase the message from the screen. During this period, you should try to correct the problem by reconnecting the cable or patient lead, or changing the watertrap, if appropriate. At the end of the silence period, if the condition still exists, the audible alarm will announce the problem again.

Suspending alarms – If the problem cannot be corrected, or if you want to ignore this measurement, you can suspend a measurement invalid alarm by pressing the corresponding **ALARMS Off** button. This will erase the message from the screen and prevent further audible alarms and messages for this condition. The dashes "---" will be solid, not blinking.

The **ALARMS Off** buttons are:

- **HR ALARMS Off** for heart rate.
- **SpO_2 ALARMS Off** for oximetry levels and pulse rate.
- **BP ALARMS Off** for blood pressure.
- **RESP ALARMS Off** for respiration rate (model 622xx). In model 623xx, this is **CO_2/RESP ALARMS Off**, and it suspends alarms for respiration rate and CO_2 levels.

Note: The **Temperature** measurement never produces an audible alarm. If the temperature probe disconnects from the patient, the display is replaced by solid dashes "---".

3.3 Instrument Problem Alarms

Instrument Problem Alarms, although they rarely occur, are of three types: 1) the Atlas Monitor detected an internal fault during power-on self test; 2) the Atlas Monitor detected an internal fault during use; 3) the Atlas Monitor reports that it lost power while in use the last time it was operating.

You will rarely see an Instrument Problem Alarm. These alarms indicate the failure of some internal circuitry. The Atlas Monitor performs a Self-Check when it is turned on. If it finds something that does not respond correctly to the tests, an Instrument Problem Alarm will be reported. Problems detected at power-on will produce an error message telling you what is wrong, but will not sound an alarm. Also, the affected measurement indicator will be blank. Problems detected during use will produce an error message and sound the Instrument Problem Alarm.

When a problem is detected by the Self-Check, the rest of the instrument may not be affected, so in most cases, you can use the monitor for the other measurements. (Be sure to contact the Welch Allyn Technical Service Department).

Silencing alarms – The audible alarm for instrument problems has a distinctly different sound from Patient Alarms and from Measurement Invalid Alarms. Press the **Silence** button to silence this alarm for a short period. This will not erase the message. Press the appropriate **ALARMS Off** button to prevent this alarm from sounding the audible alarm again and to remove the error message.

Power failure – If the AC power to the Atlas Monitor model 621xx is interrupted when the monitor is in use, either because of a power failure or because the AC cord was pulled out without turning off the Atlas Monitor first, an alarm will occur when the system is plugged in and turned back on.

A message will appear reporting that the power was interrupted and settings were lost. The Atlas Monitor may not remember changes that you made to alarm limits and Advanced Configuration menu entries during the last session. You should review your settings to ensure that you have the proper values set.

The alarm and error message will clear when you press any button on the Atlas Monitor.

The power failure alarm should not occur on Atlas Monitor models 622xx and 623xx because the built-in battery will keep the system running during a power failure or power cord being pulled out.

3.4 Battery Alarms (Models 622xx & 623xx)

Battery Alarms indicate that there are 10 or fewer minutes of battery life remaining. When one minute of battery life remains, a final alarm tone indicates that the Atlas Monitor is about to shut down, and a Trend report is automatically printed.

Battery problems – When the Atlas Monitor is running on battery power, it will warn you when there is less than 10, less than 5, and less than 1 minute of life remaining in the battery.

If you are using battery power, the AC indicator (**AC ~**) on the front panel will not be lit. The monitor will run on battery power for about one hour, depending on what patient measurements are being taken. More power is required by NIBP than by some of the other measurements because the air pump is used. This means that if you are not taking blood pressure readings, the battery power will last longer. Printing also uses more power.

Low battery power – When only 10 minutes of battery power is left, a chime sounds and a message appears on the screen. The chime will sound a reminder every two minutes.

Very low battery power - When the battery has only 5 minutes of power left, a message appears and a chime sounds every minute.

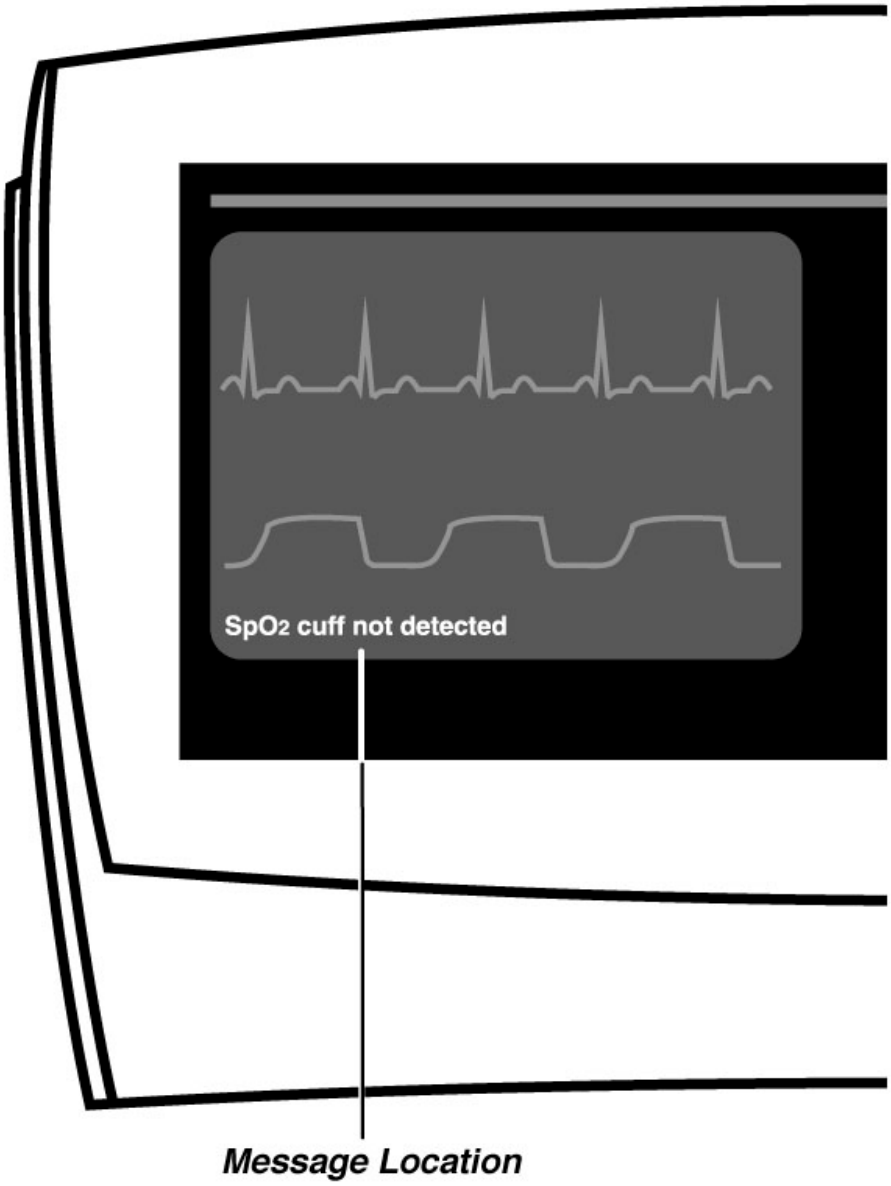
Battery Depleted - When the battery power is depleted, the Instrument Problem Alarm sounds, a message is displayed, and the monitor will automatically shut off within one minute.

If the Atlas Monitor is equipped with a printer, it will print out a Trend report before shutting off if there is any trend data that has not been printed yet.

Note: Atlas Monitor model 621xx does not have a battery option.

Recharging the battery – The battery is permanently installed. The battery is recharged whenever the instrument is operating on AC power.

Note: It takes about five hours to recharge a battery that is completely depleted to the 80% level. It can take up to 24 hours to charge a depleted battery to full capacity.



Atlas Monitor showing location of system message

4 Capturing and Displaying Trend Data

Trend data is captured at every Blood Pressure cycle, whether it is automatically timed or manually initiated. If automatic BP timing is turned off, trend data will be captured every 15 minutes. Display the data by pressing **Trend**. *Then press* **Print** *to print it. Trend data is erased when the instrument is shut off. The Atlas Monitor can capture and hold up to 144 lines of trend data. This is 36 hours of data at 15 minute intervals. If the intervals are shorter, naturally the total time covered in the trend data is shorter. A table on this page shows these times.*

Viewing trend data - To see trend data, press the **Trend** button below the screen. The latest measurements are shown at the top of the screen. Scroll through the trend data with either **Set** button. Return to the waveform screen by pressing **Trend** again. The system will automatically return to the waveform screen after 3 minutes of displaying the Trend screen.

All trend data is captured at every blood pressure cycle whether automatically timed or manually initiated. Automatic blood pressure cycles occur at **1, 3, 5, 10, 15, 30** or **60** minute intervals, as determined by the **Auto** button located below the blood pressure indicators. Pressing the **Auto** button cycles to the next interval. One of these intervals is labeled "**X**" for manual timing mode. When this is lit, blood pressure is not taken automatically, and trend data is captured every 15 minutes without any action from you. If the blood pressure **Auto** setting is greater than 15 minutes, Trend data will be captured every 15 minutes.

A blood pressure cycle is manually started by pressing the **BP Start/Cancel** button. All trend data is captured when this happens. Also, a blood pressure cycle that has been canceled by pressing the **BP Start/Cancel** button is shown by dashes in the trend screen.

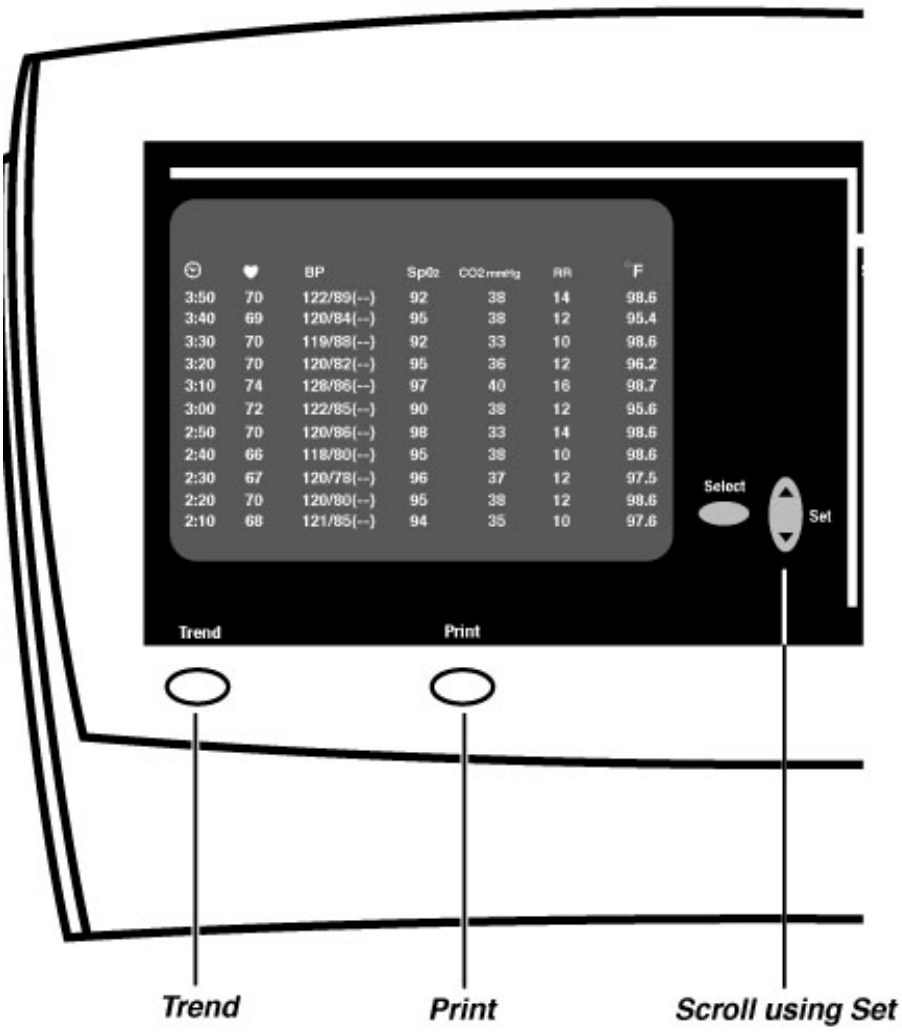
Trend data: Printing, Erasing - The only way to preserve the trend data is to print it. Press **Trend** to display the data, then press **Print**. All the trend data will be printed; you do not need to scroll to the other screens of data to print them.

Trend data is always erased when the instrument is shut off.

Note: If the monitor was not turned off between patients, the printed trend data will include that recorded from previous patients. Trend data is only erased when the unit is turned off.

Invalid or missing trend data – Invalid data or measurements that are not active are displayed by dashes in place of the data, on both the Trend screen and the printout.

Trend Data Capacity	
Auto setting (minutes)	**Trend capacity (hours)**
1	2.4
3	7.2
5	12
10	24
15, 30, 60, X	36



Atlas Monitor showing Trend display with associated controls

5 Using Print and Waveform Freeze

Pressing the **Print** *button prints the waveforms (and current measurements) if the waveforms are displayed. If a screen of trend data is displayed, all the trend data is printed. Atlas Monitors without printers have a* **Freeze** *button that halts the waveform display for 10 seconds for examination.*

Print or Freeze - Except for model 623xx, the printer is optional. Your Welch Allyn Atlas Monitor has a printer if there is a button labeled **Print** beneath the screen. If there is no printer, this button is labeled **Freeze**.

Printing waveforms - To print the waveforms and the current measurements, press **Print** while the screen shows the waveforms. When you print waveforms, the waveforms are printed starting from 9 seconds before you pressed the **Print** button until 6 seconds after you pressed it. The numeric data is captured and printed at the moment that the **Print** button is pressed.

Printing trend data – To print trend data, press **Trend** to view the data on the screen, then press **Print**. If trend data is displayed and you want to print the waveforms, press **Trend** to go back to the waveforms, then press **Print**.

Note: If the monitor was not turned off between patients, the printed trend data will include that recorded from previous patients. Trend data is only erased when the unit is turned off.

Freeze - If your monitor does not have a printer, it has a **Freeze** button. Pressing this button halts the waveforms. You can then examine something on the screen before it is overwritten. The heart rate and alarm status are not updated during a freeze.

Three events can end the freeze period and return the waveforms to the normal, updating mode:

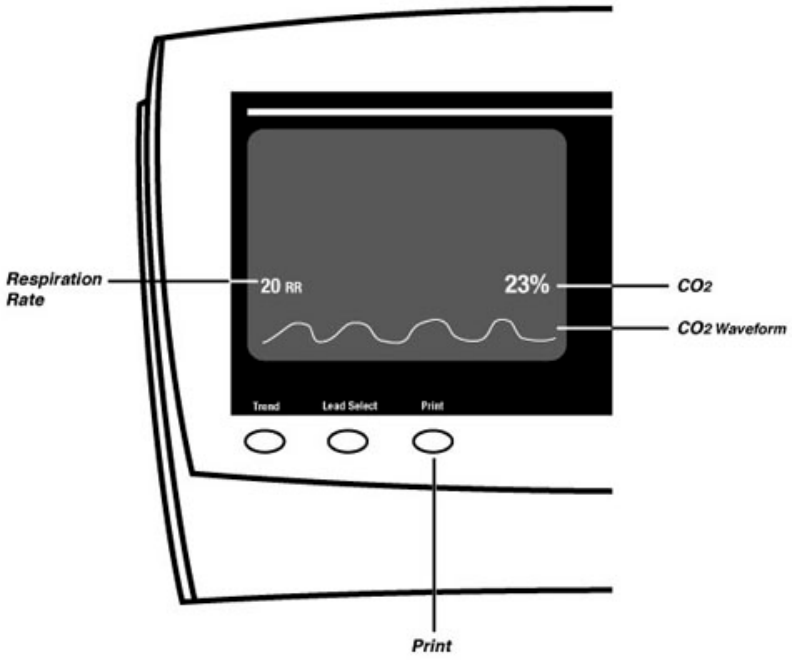
- Pressing **Freeze** a second time ends the freeze period.
- Ten seconds after you press **Freeze**, the waveform starts again, automatically.
- Any patient alarm or instrument problem alarm that affects the frozen display will end the freeze period.

Note: No data is lost during the freeze period. Data is still added to the trend list during this time.

ECG waveforms – Changing the **ECG bandwidth** affects both the displayed and printed waveforms. The bandwidth choices in Advanced Configuration are:

- **Monitor** — a narrow bandwidth which produces a cleaner waveform printout.
- **Extended** — a wider bandwidth which allows better viewing of the **ST** segment and enhanced detail of the pacemaker signals in a paced patient.

Note: It is normal for the ECG baseline to wander slightly in Extended bandwidth.



Atlas Monitor showing waveform display and printed waveform record

5.1 The Printer – Loading Paper and Troubleshooting

The printer has an easy loading feature that doesn't require threading the paper strip. The lid is popped open, the thermal paper roll placed into the well with the correct surface towards the front, and the lid is shut.

The printer - If your Atlas Monitor has this feature, the printer is located on the top center of the monitor, covered by a lid. The lid can be popped open by pushing the button located on the right side of the lid.

Printer paper – The printer is designed for thermal paper only. The suggested size for the paper roll is 2.25 inches (58 mm) in width and 100 feet long. Black ink is recommended.

Loading printer paper – A convenient feature developed for the Atlas Monitor printer is that no threading is involved to load the printer paper. To load paper:

- Open the printer door by pressing on the button and lifting the lid.
- Place the roll into the printer well with the thermal, coated side facing out, towards you.
- Pull enough of the paper out so that the strip will appear beyond the lid.
- Shut the lid to hold down the strip of paper.

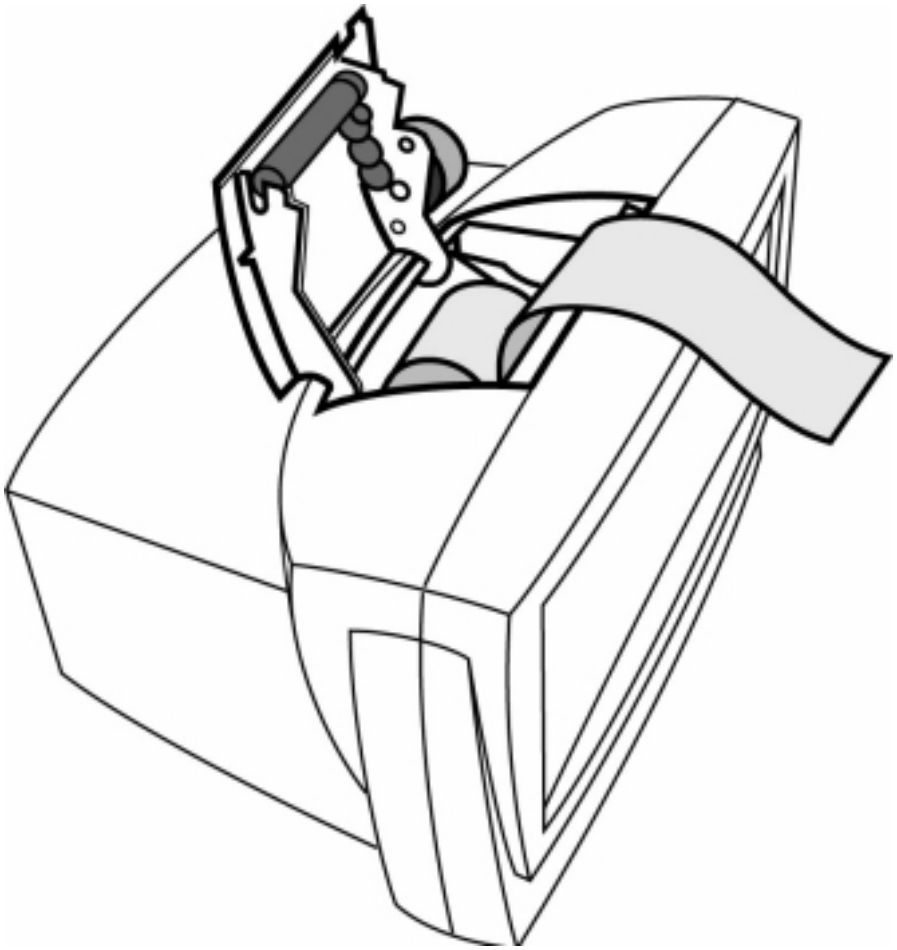
Note: The coated side for thermal paper is markable by a fingernail scratch, the non-coated side is not.

Note: Some manufacturers of paper may produce paper rolls with the thermal side facing the inside of the roll. The Atlas Monitor printer will work with the paper rolled either way, as long as the thermal side faces towards the front of the monitor.

If it won't print – The printer will not print if there is no printer paper or if the printer door is open. Check to see that the thermal coated side of the paper is loaded against the print head (towards the front).

The end of the paper must extend out of the slot between the printer door and top of the monitor.

Make sure that the printer door is completely latched closed.



Atlas Monitor showing paper being loaded

6 Connecting to the Patient

The main patient connections are for NIBP, SpO_2, and ECG. Atlas Monitor models 622xx and 623xx additionally provide temperature measurement, and the model 623xx adds $ETCO_2$. If you do not use all the measurement capabilities of the monitor, you will not have alarms for the measurements you do not use. You may connect the sensors to the patient before or after you turn the unit on.

The Welch Allyn Atlas Monitor can only do its job when it is properly connected to a patient through the various sensors. You may turn on the monitor before you connect any leads to the patient. No alarm will sound until a valid measurement is made.

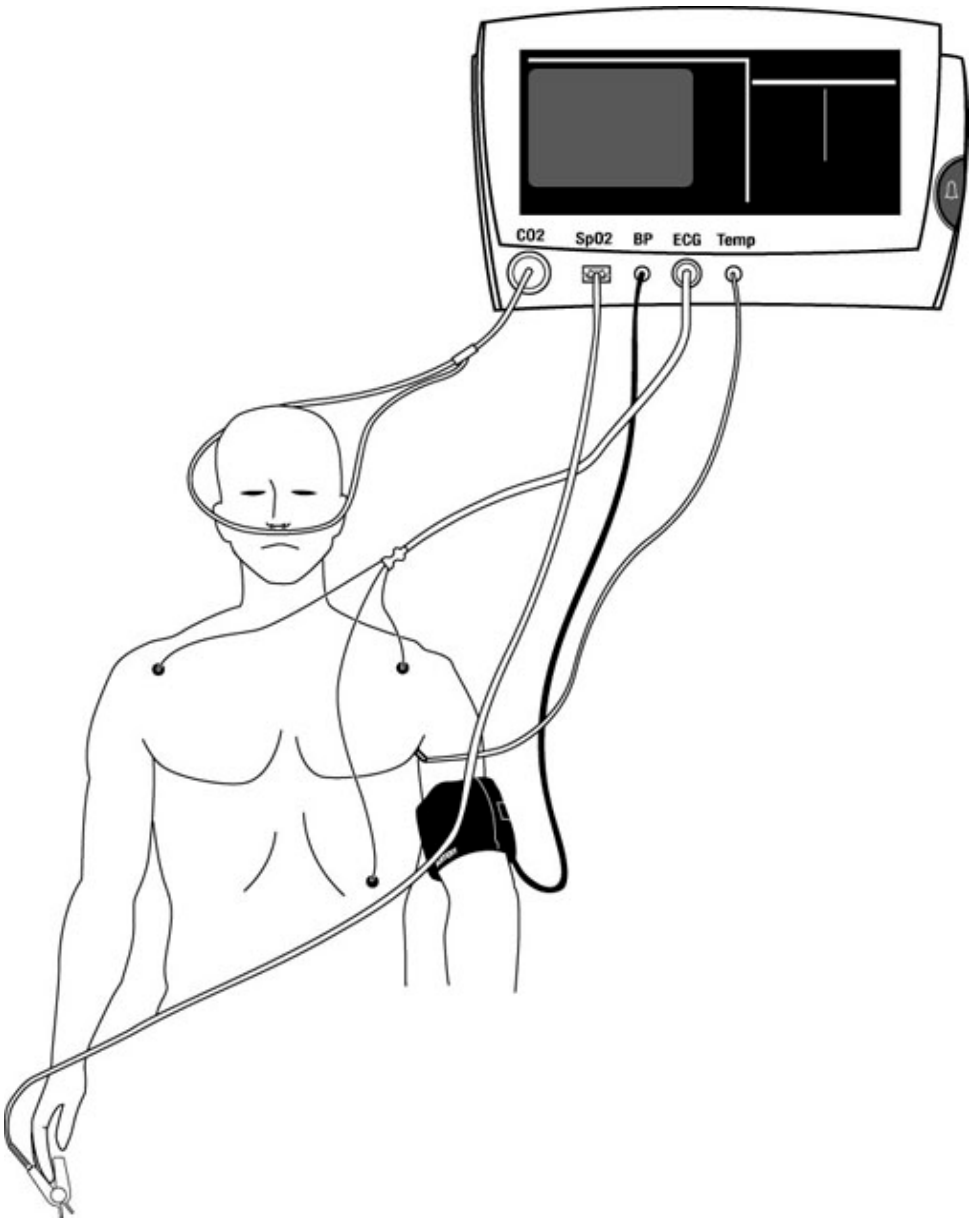
Patient connections - The first step is usually to connect the sensor cables and tubes to the monitor, and then to the patient. For convenience, all sensors connect to the front of the machine. Also, all of the sensors have different types of connectors, so there should be no confusion when connecting cables and tubes.

Caution: It is possible to incorrectly connect the blood pressure tubing to the CO_2 watertrap. Note that this is not a patient safety issue, only that $ETCO_2$ readings will not be captured and a CO_2 alarm will sound. It is recommended that the blood pressure tubing be left connected to the monitor, and the cuff removed when necessary using the quick-release connector.

Unused features - You don't have to use all the measurement capabilities on the monitor. For instance, if you want ECG only, just connect these leads. Other features that are not connected will not produce alarms.

Warning: Impedance Respiration rate measurement and alarm capability are active ONLY when the second trace option is set to Respiration. Should the operator change from viewing the Respiration waveforms and breath rate to another selection (SpO_2, CO_2 or ECG) the Respiration rate monitoring and alarm capability will be disabled. This occurs even if the ECG cable is still inserted into the Monitor.

Warning: End tidal carbon dioxide ($ETCO_2$) and breath rate measurement and alarm capability are active ONLY when the second trace option is set to **CO_2**. Should the operator change from viewing the $ETCO_2$ and breath rate waveforms and data to another second trace selection (**SpO_2**, **Respiration** or **ECG**) the CO_2 and breath rate monitoring and alarm capability will be disabled. This occurs even if the watertrap and cannula are still inserted into the Monitor.



Atlas Monitor showing hookup of patient sensors

6.1 Connecting the NIBP Cuff

Select the proper cuff size (Small, Adult, Large Adult, or Extra Large Adult). Place cuff on patient, correctly oriented. Connect the tubing to the cuff and to the monitor. Blood pressure measurements can be taken automatically or manually.

BP cuff sizes - For accurate blood pressure measurements, it is important to select the proper cuff size. The Atlas Monitor comes with a Large Adult cuff. This is the correct cuff for most adults. (Other sizes are available from Welch Allyn: Small, Standard Adult and Extra Large Adult).

Warning: The Welch Allyn Atlas Monitor is not designed for use on children younger than 3 years old.

A good way to assure proper cuff size is to wrap the cuff around the patient's upper arm and inspect it. Welch Allyn cuffs are marked with a distinct white edge and two divisions that indicate "range." When the cuff fits properly, the white edge marked "Index" will meet the cuff at some point within the "Range" as shown in the illustration.

You can also determine cuff size by measuring the patient's arm circumference midway between the elbow and shoulder, and then use the chart below to select the correct cuff.

CUFF SIZE	ARM CIRCUMFERENCE	
	INCHES	CENTIMETERS
Small	4.7 – 8.3	12.0 – 21.0
Adult	7.1 – 12.6	18.0 – 32.0
Large Adult	8.3 – 15.4	21.0 – 39.0
Extra Large Adult	11.8 – 18.5	30.0 – 48.-0

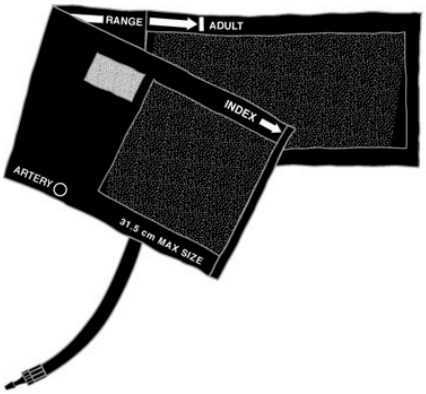
Cuff placement – The preferred blood pressure measurement site for adults and children is the upper arm. The arm must be relaxed and motionless during the reading. For accurate blood pressure measurements, the upper arm should be placed at the same elevation as the heart, with the lower arm passively supported.

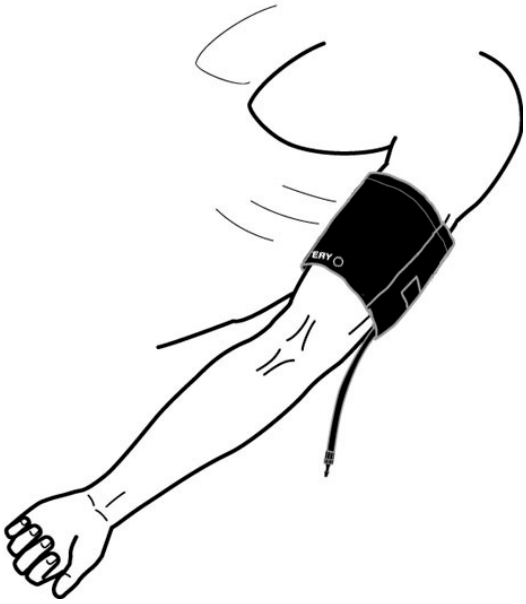
- Squeeze any air from the cuff.
- Wrap the cuff snugly around the limb with room between cuff and arm for only one or two fingers. If it is too loose, the cuff cannot inflate properly, and it may result in an inaccurate reading.
- There is a mark on the cuff indicating the proper placement, to align the cuff over the patient's brachial artery.
- Connect the hose to the cuff and to the front panel connector. The front panel connector is a simple, push-on friction fit. The tubing-to-cuff connection is a twist-on connection. Be sure the hose is not kinked or pinched.

Warning: Do not apply the cuff to any extremity being used for other diagnostic monitoring or therapeutic intervention, which may include intravenous infusions, intra-arterial lines, A-V shunts, PIC lines, and central venous lines.

Warning: Do not place the cuff on any area where circulation might be compromised. In a situation involving repeated blood pressure measurements, monitor the circulation of the limb to ensure that blood flow is not compromised.

Warning: Do not place the cuff on an arm that is also being used for SpO_2 monitoring. Blood pressure cuff inflation during SpO_2 measurement will cause inaccurate SpO_2 results and false alarms.





Correct placement of NIBP pressure cuff

Blood pressure measurements – Blood pressure cycling can be scheduled automatically or started manually, as determined by the choice selected by the **Auto** button. When you turn on the monitor, the **Auto** setting defaults to "**X"**, but it remembers the previous setting. Press the **Auto** button once to return to the previous setting, or press it repeatedly to select a new interval. Or choose "**X**" for manual operation. Wait 10 seconds for the selected **Auto** value to stop flashing. If any value other than "**X**" is selected, the first automatic measurement will begin 20 seconds after the **Auto** LED stops flashing.

If you press **BP Start/Cancel** between automatically timed measurements, the cuff will begin to inflate immediately and the monitor will record a new set of measurements. The manual measurement will not interfere with the automatic timing unless the next automatic measurement is scheduled to occur within 30 seconds of the end of the manual measurement.

Pressing **BP Start/Cancel** during a blood pressure measurement will cause the cuff to deflate immediately, and the reading is canceled. The trend data for that reading will show as dashes "---" on the screen and in the printout.

Both Systolic and Diastolic blood pressures are displayed on the front panel. During measurement, the Systolic display shows the cuff pressure as it pumps up and steps down. Mean Arterial Pressure (MAP) is displayed on the screen (upper left) only if it is enabled in the Advanced Configuration menu.

Note: MAP is calculated using the formula: one third of the Systolic reading plus two thirds of the Diastolic reading.

Principles of Operation – The Atlas Monitor uses an 'oscillometric' method to measure the patient's blood pressure. This technique is characterized by inflating the blood pressure cuff until the arterial blood flow is occluded, and then slowly releasing the cuff pressure and monitoring the oscillations in the cuff air pressure due to arterial blood flow pulses. While the cuff is deflating, the amplitude of the oscillations are recorded versus cuff pressure. The systolic measurement is found by noting the cuff pressure when the pre-maximum oscillations are at a fixed percentage of the maximum oscillations. Similarly, the diastolic pressure is found by noting the cuff pressure when the post-maximum oscillations are at a fixed percentage of the maximum oscillations.

If the initial cuff pressure is insufficient to occlude the arterial blood flow, the instrument will re-inflate the cuff by approximately 40 mmHg. During deflation, the instrument may also re-inflate in order to re-measure the oscillations.

6.2 Connecting the SpO_2 Fingerclip Sensor

The SpO_2 fingerclip sensor provides the means to take the oximetry and pulse readings. Clip the fingerclip sensor to the patient, making sure it is in the correct orientation. Connect the sensor to the monitor. The sensors come in sizes for adult and child. A range of sensors are available to attach to the patient's finger, toe, nose, forehead, or ear.

Fingerclip sensors – Pulse and oximetry are measured from a fingerclip sensor. There are several sizes of fingerclip sensors, and they come in both reusable and disposable styles. Sensors come in sizes for adults and children. There are also sensors available that use the toes, forehead, ear or nose as the measurement sites.

Connecting – Clip the sensor to the patient's finger. Make sure the cable to the sensor is attached properly to the SpO_2 connector.

Warning: Do not place the fingerclip sensor on an arm that is also being used for blood pressure monitoring. Blood pressure cuff inflation during SpO_2 measurement will cause inaccurate SpO_2 results and false alarms.

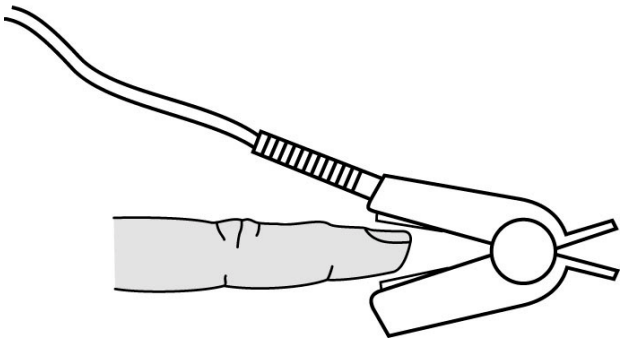
Note: Avoid excessive ambient light, which can affect sensor performance, by keeping the fingerclip sensor and sensor site covered with an opaque material.

Note: Prolonged use of the pulse oximetry probe may require you to change the location of the probe. Move it to another finger every few hours. Monitor skin condition and circulation in the finger.

Note: Atlas Monitors are available with either Nellcor or Nonin compatible SpO_2 systems. The sensors are not interchangeable between these two types of systems. If you fail to see any SpO_2 or Plethysmograph readings, check to see that you have not inserted the wrong brand of sensor into the Atlas Monitor.

Performance factors –Many factors may degrade the performance of the pulse oximeter, as indicated by a lowered rise of the Plethysmograph display (next to SpO_2 display). These include:

- Excessive ambient light, particularly fluorescent light.
- Excessive patient movement.
- Excessive duration on one finger.
- Cold hands/digits.
- Electrosurgical interference.
- Arterial catheters, blood pressure and fusion lines.
- Moisture in the sensor.
- Improperly attached sensor.
- Incorrect sensor for the patient.
- Poor patient perfusion.
- Venous pulsations.
- Anemia or low hemoglobin concentrations.
- Cardiovascular dyes, such as methylene blue.
- Fingernail polish.
- Strongly pigmented skin.



Correct placement of reusable Nellcor SpO_2 fingerclip sensor

6.3 Connecting the ECG Electrodes

Prepare the patient's skin, attach the leads to the electrodes, place the electrodes in the three (or five) correct locations, and plug the ECG cable into the monitor. The heart rate alarm usually operates in conjunction with the ECG measurement.

Connecting - Connect the ECG leads to the patient:

- Thoroughly clean the patient's skin at each place where an electrode will be attached. Shave if necessary. Attach lead wires to the electrodes before applying them to the patient.
- Apply the electrodes to the patient as shown in the diagrams for 3 wire and 5 wire locations.
- Attach the ECG cable to the front panel connector.
- Support the ECG cable so it does not stress the electrode wires, the ECG cable connectors, or electrodes. Ensure that conductive parts of the electrodes and their connectors do not contact any other conductive parts, including earth.
- Verify that the monitor is configured for the number of leads you are using.
- You should now see an ECG waveform scrolling across the upper part of the monitor screen. If you do not, check the wires, electrodes and cable.

3 wire or 5 wire - Either 3 wire or 5 wire ECG leads can be used with the Atlas Monitor. You must select either the 3 wire or 5 wire setting in Advanced Configuration to match the leads you are using. To change the lead set, press the **Date/Time** button, then press **Trend**. The screen will display the Advanced Configuration menu. Scroll down to the **ECG lead set** selection using either **Select** button. Press the **Set** button to choose 3 wire or 5 wire. After you make the choice, press the **Trend** button again to exit the Advanced Configuration menu.

You can quickly determine whether the monitor is set for 3 wire or 5 wire ECG: press the **Lead Select** button and watch the lead selection indicator in the upper right corner of the screen.

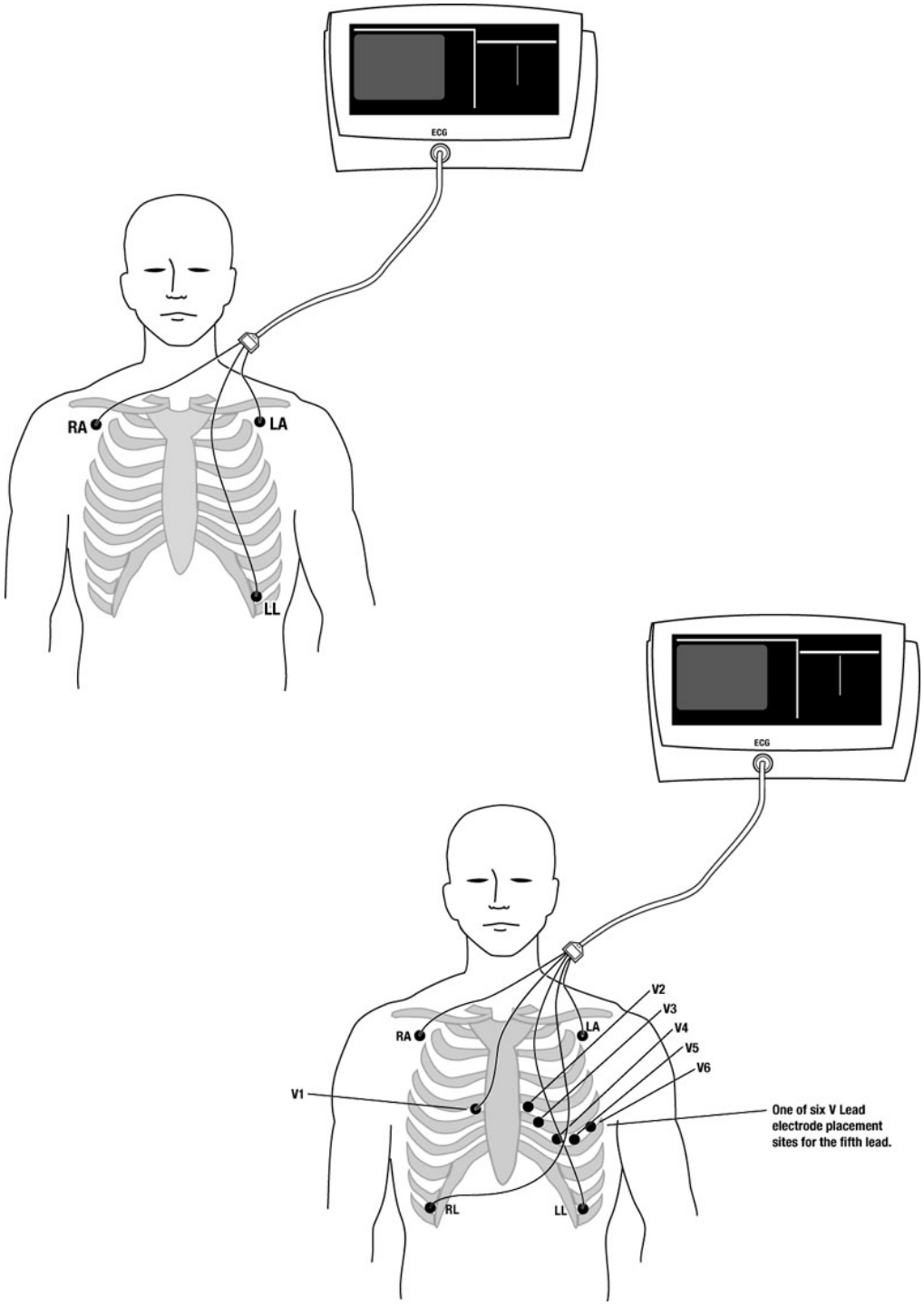
- For 3 wire, **Lead Select** will cycle through **I**, **II**, **III**.
- For 5 wire, **Lead Select** will cycle through **I, II, III, aVR, aVL, aVF, V**.

3 Wire Lead Colors & Symbols				
Lead	**AHA**		**IEC**	
Right arm	White	**RA**	Red	**R**
Left arm	Black	**LA**	Yellow	**L**
Left leg	Red	**LL**	Green	**F**

5 Wire Lead Colors & Symbols				
Lead	**AHA**		**IEC**	
Right arm	White	**RA**	Red	**R**
Left arm	Black	**LA**	Yellow	**L**
Left leg	Red	**LL**	Green	**F**
Right leg	Green	**RL**	Black	**N**
Chest	Brown	**V**	White	**C**

Interference factors - If an electrosurgical unit is going to be used, place the ECG cable and wires as far as possible from the site of the surgery and from the electrosurgical cables. This will minimize interference. Also ensure that the electrosurgical return cable (neutral) is well attached and making good contact with the patient.

Impedance Respiration – In some patients, impedance respiration detection may be inadequate using the standard ECG electrode placement. In these cases, change the LA and RA electrode placement to the mid-axillary line on each side of the chest as shown in the illustration.

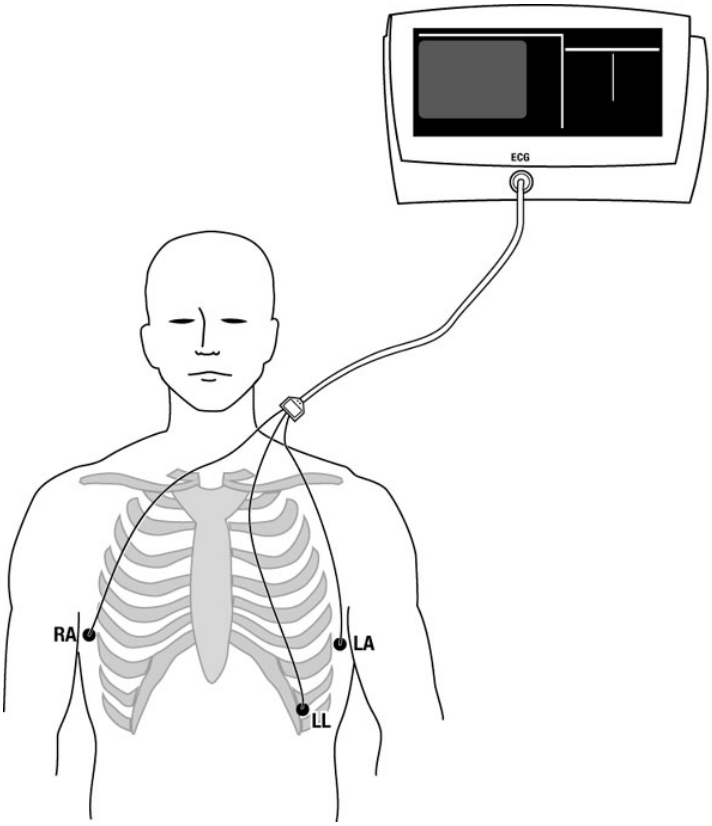


Correct placement of 3 wire and 5 wire ECG electrodes

V-Lead Placement – The brown V-lead connector can be placed at one of six standard locations:

- V1 –Right Sternal border, fourth intercostal space.
- V2 – Left sternal border, fourth intercostal space.
- V3 –Between V2 and V4, midpoint between the two, in a line that joins all three.
- V4 – Mid-clavicular line, fifth intercostal space.
- V5 – Anterior axillary line, fifth intercostal space.
- V6 – Mid-axillary line fifth intercostal space.

Note: If you wish to see a cascading ECG waveform from the upper line to the lower line on the display, you must set the **Second trace source** to **ECG** in the Advanced Configuration menu.



Alternate ECG electrode placement for Impedance Respiration

6.4 Connecting the Temperature Probe (Models 622xx & 623xx)

The Temperature measurement comes from a skin probe.

Atlas Monitor models 622xx and 623xx can measure skin temperature with the supplied surface probe. Follow the package instructions for probe placement.

Fahrenheit or Celsius - Temperature is displayed in °F or °C. The current setting is indicated next to the temperature measurement.

You can change the **Temperature units** in Advanced Configuration:

- Press the **Date/Time** button.
- Press **Trend.**
- Use either **Select** button to select **Temperature units**.
- Use either **Set** button to change between **°F** and **°C**.
- Press **Trend** to exit Advanced Configuration.

No alarm - The temperature display is an indicator only; there is no alarm for temperature. If the monitor is unable to read a temperature properly, dashes will appear in place of the temperature measurement.

Note: The temperature display is blank at power-up and will remain blank until a temperature probe is detected.

6.5 Connecting the End Tidal CO_2 Sample Tube (Model 623xx)

$ETCO_2$ is measured with a sample tube using a nasal cannula adapted for sidestream CO_2 measurement. Attach the cannula to the patient's nose. Connect the sample tube to the watertrap and plug the watertrap into the monitor. The watertrap must be replaced after every six hours of use. An alarm sounds if the watertrap becomes full.

End Tidal CO_2 is collected through a sample tube with a cannula adapted for nasal use, and a watertrap. These items are supplied with the monitor. CO_2 connectors are available from medical supply vendors for direct connection to ET tubes and LMAs.

Connecting the CO_2 airway -

- Place the cannula below the patient's nose so that the tubes enter the nostrils.
- Direct the tubing along both cheeks and over the patient's ears.
- Bring the tubing together beneath the patient's chin and slide the plastic ring up to the chin for a snug and comfortable fit.
- Join the CO_2 watertrap to the sample line.
- Plug the watertrap into the front panel of the monitor at the connector for CO_2 analysis. Be sure to push it in until it is firmly seated.

Note: When $ETCO_2$ is displayed, the breath rate is on the left and the CO_2 concentration is on the right above the CO_2 waveform.

Watertrap – The watertrap should be replaced after every 6 hours of use. If the watertrap is full, an alarm will sound and a message reading "Replace CO_2 watertrap" will appear on the screen. The message "CO_2 watertrap occluded" may also appear. If this happens, change the watertrap.

Correct placement of CO_2 nasal cannula

7 Using The Menus

Two menus are provided for configuring the Atlas Monitor. The items on these menus are choices that you might make to configure the Atlas Monitor to your needs when you first place it into service. You may change the date/time setting for Daylight Savings/Standard time, or when traveling across time zones. You might change the Advanced Configuration settings when monitoring different patient health issues, or for different display preferences.

7.1 The Set Date and Time and Other Options Menu

Pressing the **Date/Time** *button on the bottom right of the monitor will access a menu from which you can manage several settings. The Time and Date can be set using the* **Select** *and* **Set** *buttons. The Other Options menu provides a list of buttons that have special functions.*

Setting Date and Time - You will need to set the Date and Time when:

- First unpacking and installing the monitor.
- Adjusting to different time zones.
- Starting or ending Daylight Savings Time.

To set the Date and Time:

- Press the **Date/Time** button (labeled with a clock icon) to get to the Set Date and Time menu.
- Use either **Select** button to sequentially highlight the day, month, year, hours, minutes and seconds.
- Use either **Set** button to scroll through the values for each setting.
- Stop pressing the **Set** button when the correct value is shown.
- Use either **Select** button sequentially to highlight the next item you want to set, and repeat.
- Press the **Date/Time** button again to return to the waveform screen when the date and time are correct.

The monitor now has the correct Time and Date, and the monitor's internal battery will retain these settings, even after turning off the power and unplugging the monitor.

Other Options menu - the buttons:

- **Trend**
- **Lead Select**
- **Print (**or **Freeze)**
- **CO_2/RESP ALARMS Off** (model 623xx only)

which have been described earlier, serve a second function, which is listed on this menu.

The **Trend** button accesses the Advanced Configuration menu, which allows other settings to be changed.

The **Lead Select** button accesses the Service Mode screen, which allows a qualified technician to service various aspects of the monitor.

Note: Service Mode is never used by the clinician and is not to be used in any patient-oriented operation of the monitor.

The **Print** button (or **Freeze** in those monitors without a printer) saves the current alarm settings as set by the user. These saved alarm settings are used instead of the factory defaults when the instrument is turned on.

The **CO_2/RESP ALARMS Off** button initiates the process of CO_2 Reset.

Exiting the Set Date and Time Menu - To exit the menu, press the **Date/Time** button again.

Atlas Monitor model 623xx showing the Advanced Configuration and the Set Date and Time menus

7.2 The Advanced Configuration Menu

The Advanced Configuration menu provides options to configure monitoring settings for your specific needs. Access Advanced Configuration by pressing the **Date/Time** *button, then the* **Trend** *button.*

What's it for? - This menu allows the user to choose other options available with the monitor. You may never need to change Advanced Configuration settings. Most of the settings are satisfactory for normal use as shipped from the factory. Some users may make a few adjustments when they first set up the monitor, then may discover no further need to make changes.

Advanced Configuration menu - To get to the Advanced Configuration menu:

- Press the **Date/Time** button. This will access the Set Date and Time and Other Options menu.
- Press the **Trend** button to enter the Advanced Configuration menu.
- Press either **Select** button to highlight the parameter you want to change.
- Press either **Set** button to choose the value you want for the parameter.
- Press either **Select** to move on to the next parameter, or
- Press **Trend** to exit the menu and return to the waveform display.

Advanced Configuration Details - The table lists all of the Advanced Configuration menu items and the possible settings. Some of these options may not appear on the monitor you are using, depending on the model.

Advanced Configuration Menu Settings		
Advanced Configuration Item	**Possible settings**	**Factory default**
Language	English, French, Spanish, German, Portuguese, Italian, Chinese, Japanese	English
Silence duration	60, 90, or 120 seconds	90 seconds
ECG gain	automatic, or 10mm/mV	automatic
ECG lead set	3 wire or 5 wire	3 wire
ECG speed	6.25, 12.5, or 25 mm/s	25 mm/s
ECG bandwidth	Monitor or Extended	Monitor
Initial pressure	120, 140, 160, 180, 200, 240, 280 mmHg	160 mmHg
MAP	Yes or No	No
Second trace selection (621xx)	ECG or SpO_2	ECG
Second trace selection (622xx)	ECG, SpO_2 or Respiration	ECG
Second trace selection (623xx)	ECG, SpO_2, Respiration or CO_2	CO_2
Temperature units (622xx and 623xx)	ºF or ºC	ºF
Respiration speed (622xx and 623xx)	12.5, 6.25, 3.125 mm/s	6.25 mm/s
CO_2 units (623xx)	mmHg, %, or kPa	mmHg

7.2.1 Advanced Configuration Menu Settings

The Advanced Configuration menu offers settings to customize the Atlas Monitor to suit your needs. Not all options are available on all models.

Language - Factory default will be set for the dominant language used in your country. Of course, if you are more familiar with another language, the monitor provides a choice of eight.

Silence duration - The large **Silence** button on the right edge of the monitor allows you to turn off all of the alarms simultaneously – for a short duration lasting either **60, 90,** or **120** seconds.

ECG gain - When **10 mm/mV** gain is chosen, the height of the vertical ruler that appears to the left of the ECG waveform is 10 mm high and indicates a 1 mV amplitude. When **automatic** gain is selected the ruler height will vary, but it will always indicate a 1 mV signal size. The ruler size is automatically increased or decreased to scale to a particular set of waves, but the vertical line still indicates the same amplitude of 1 mV.

ECG lead set - The Atlas Monitor allows for both **3 wire** and **5 wire** ECG lead sets.

ECG speed - The amount of ECG waveform shown on the CRT is determined by the trace speed. A slower trace speed means more seconds of waveform are shown on the CRT.

ECG bandwidth - The ECG waveform can be displayed and printed in either **Monitor** or **Extended** bandwidth. **Monitor** mode allows for a clearer picture of the waveform by filtering out noise. **Extended** mode, usually used with cardiac paced patients, shows the finer nuances of ECG waveform facilitating the detection of conditions such as ischemia.

Initial pressure – Specifies the initial blood pressure cuff pump-up pressure. If this pressure is not enough to complete a blood pressure measurement, the cuff will re-inflate with a higher target pressure and re-attempt the measurement.

MAP - The Mean Arterial Pressure can be displayed on the screen, above the ECG waveform. This measurement is calculated from the Systolic and Diastolic readings. The choices are **Yes** (MAP is displayed) or **No** (MAP is not displayed).

Second trace selection – All models offer a choice of displaying a second line of **ECG** waveform or displaying the **SpO_2** waveform. Model 622xx adds the option of displaying Impedance **Respiration** as the second trace. Model 623xx adds the option of displaying **CO_2** concentration as the second trace.

Temperature units - In models 622xx and 623xx, temperature can be displayed as either Celsius **°C,** or Fahrenheit **°F.**

Respiration speed – Models 622xx and 623xx allow the Impedance Respiration or CO_2 waveforms to be displayed at three different speeds.

CO_2 units – The concentration of Carbon Dioxide can be expressed in millimeters of mercury (**mmHg**), percent (**%**), or kiloPascals (**kPa**). The values displayed for percentage and kiloPascals are calculated from the mmHg

partial pressure based upon current barometric conditions.

8 Cleaning and Maintaining the Atlas Monitor

No harsh chemicals should be used for cleaning the monitor. A mild detergent solution works well. Care should be taken to keep liquids away from the monitor and its connecting parts. Servicing should be performed by a qualified technician at 6, 12, and 24-month intervals.

Cleaning – The Welch Allyn Atlas Monitor may be wiped clean with a slightly damp cloth and a mild detergent solution. Never immerse the monitor in any type of liquid. As necessary, the monitor may be cleaned with an appropriately diluted, non-staining disinfectant solution.

Warning: Take care that no water or other liquids enters any of the connectors. If this should occur, dry them with warm air. Then check all the monitoring functions to be sure everything works properly.

Blood pressure cuff – The blood pressure cuff should be cleaned by sponging with a damp cloth.

Connections – Cables and hoses can be wiped with a damp cloth and mild detergent. Do not immerse the hoses or the cables.

Fingerclip sensor – The reusable SpO_2 fingerclip sensor may be cleaned with isopropyl alcohol and may be sterilized with ethylene oxide (EtO), cold cycle. Do not immerse the sensor.

Temperature sensors – The temperature probes and probe covers should be handled as biohazard material after use and must be sterilized.

$ETCO_2$ watertrap – The watertrap for $ETCO_2$ should be replaced after every six (6) hours of use. The watertrap should be handled as a biohazard after use.

CO_2 Reset - The monitor keeps track of when the CO_2 subsystem was last reset. If the monitor has been unused for a long time, is just being set up, or if it has been more than one month since its last reset, you may see a message on the screen indicating that a **CO_2 Reset** is recommended.

To perform a **CO_2 Reset**:

- Press the **Date/Time** button on the lower right of the monitor.
- The Set Date and Time and Other Options menu will be displayed.
- Select the **Reset CO_2** selection by pressing the **CO_2/RESP ALARMS Off** button.
- This will access a screen titled CO_2 Reset.
- Follow the instructions on the screen.
- You will be told to remove the CO_2 watertrap
- You will be told to install the **CO_2 Scrubber** into the CO_2 watertrap socket. The Scrubber looks similar to a watertrap, but is filled with white granules. It is included with model 623xx. The Scrubber must be attached to the watertrap. Remove the tubing from the watertrap and attach the Scrubber to the watertrap. Insert the watertrap/Scrubber combination into the watertrap socket.
- There may be a message indicating a 5 minute **Warming Up** period.
- The system will report that it is **Sampling.**
- The system will then report **Reset Complete.**
- Remove the watertrap/Scrubber from the watertrap socket.
- Detach the Scrubber from the watertrap

and reattach the tubing.
- Replace the watertrap in the watertrap socket.
- Press **Trend** to return to the normal screen.

CO_2 Scrubber - The CO_2 Scrubber has an indefinite lifespan when used at the normal rate of one CO_2 reset every month and one CO_2 calibration every 6 months. The Scrubber can be disposed of as normal non-hazardous waste.

Servicing schedule – Servicing of the monitor should be done at 6 month intervals by a qualified service technician. It is important to maintain this schedule to assure that the measurements are accurate and that the unit is working properly at all times. There are different service requirements at 6, 12, and 24 month periods, as documented in the Technical Service Manual.

Battery Replacement (Models 622xx and 623xx) - If the monitor will not run for at least an hour on battery after being plugged in to AC for at least 24 hours, the battery may need to be replaced. It is covered by warranty for the first two years of ownership. If you are beyond the warranty period, you can replace the battery by the following method:

- Turn off the monitor and disconnect all patient sensors
- Remove the AC power cord from the rear of the monitor
- Using a TORX-10 screwdriver, remove the two screws retaining the battery cover
- Tip the monitor and slide the battery out being careful not to stress the wires
- Press the locking clip release lever on the plug that attaches the battery wires to the Atlas and pull gently to remove the plug from the Atlas
- Connect the replacement battery to the connector in the Atlas. The plug can only attach one way. The locking clip must seat on the Atlas connector
- Slide the battery into the unit, routing the wires around the edges of the battery and being careful not to pinch the wires
- Replace the battery door and secure the two screws
- Plug the Atlas back into AC power for at least 24 hours to fully charge the battery
- You may return the Atlas to service (on AC power) immediately

The battery is a non-spillable lead-acid battery. In the USA, call 1-800-SAV-LEAD for instructions on how to recycle. For International users, contact your local authorities on recycling.

9 Unpacking and Installing the Atlas Monitor

When you first unpack the monitor, you should check it for shipping damage. Then verify that you have all the accessories, documentation, and supplies.

Unpacking – As you carefully unpack the monitor, inspect it for damage from shipping. If you find any damage, notify the shipper immediately. Save the packing material. It will be useful if you have to return the monitor for any reason. Next, remove the inner packing material. Remove the plastic film that covers the front panel.

Check the accessories - check all the accessories against this list:

All models:

- 1 large adult blood pressure cuff.
- 1 SpO_2 fingerclip sensor with cable (Nonin or Nellcor).
- 1 power cord.
- 1 blood pressure hose.
- 1 ECG 3 wire lead set.
- 1 set of disposable ECG electrodes.
- (optional) 1 roll of printer paper.
- User manual.

Model 622xx: all the above plus:

- Temperature skin probe.

Model 623xx: all the above plus:

- 1 End Tidal CO_2 nasal cannula.
- 1 CO_2 watertrap.
- 1 CO_2 scrubber.
- 1 roll of printer paper.

Installing – The monitor can be installed and used on a table top, shelf or other platform. This surface should be level and stable. The Atlas Monitor can optionally be mounted on a rigid Welch Allyn custom mobile stand or wall mount.

Warning: Do not use a standard hospital mobile IV stand. The pole may tip over.

Warning: Keep the monitor away from liquids that might spill on it.

Turn the Power On – When the monitor is turned on, all alarms are enabled at the default limits, and there is no trend data. If plugged into AC power, an indicator **AC~** shows the unit is using AC power. The unit goes through an initial self-check. When this is complete, the instrument is ready to use.

CO_2 Reset - On model 623xx, you may see a message indicating that a CO_2 reset is recommended.

To perform a **CO_2 Reset**:

- Press the **Date/Time** button on the lower right of the monitor.
- The Set Date and Time and Other Options menu will be displayed.
- Select the **Reset CO_2** selection by pressing the **CO_2/RESP ALARMS Off** button.
- This will access a screen titled CO_2 Reset.
- Follow the instructions on the screen.
- You will be told to remove the CO_2 watertrap
- You will be told to install the **CO_2 Scrubber** into the CO_2 watertrap socket. The Scrubber looks similar to a watertrap, but is filled with white granules. It is included with model 623xx. The Scrubber must be attached to the watertrap. Remove the tubing from the watertrap and attach the Scrubber to

the watertrap. Insert the watertrap/Scrubber combination into the watertrap socket.

- There may be a message indicating a 5 minute **Warming Up** period.
- The system will report that it is **Sampling.**
- The system will then report **Reset Complete.**
- Remove the watertrap/Scrubber from the watertrap socket.
- Detach the Scrubber from the watertrap and reattach the tubing.
- Replace the watertrap in the watertrap socket.
- Press **Trend** to return to the normal screen.

10 Appendix A: Technical Specifications for the Atlas Monitor

A.1 General Specifications:

Size	33 x 24 x 23 cm (13 x 9.5 x 8.75 inches)
Weight	4.3 kg (9.5 lb.) (model 621xx) 6 kg (13.2 lb.) (models 622xx & 623xx)
Display Type	Cathode Ray Tube / LED
Display Size	275 x 125 mm (10.8 x 4.9 inches)
Screen Displays (numeric)	Heart Rate (ECG) MAP (mean arterial pressure) Respiration Rate (impedance respiration, models 622xx and 623xx) Respiration Rate ($ETCO_2$, model 623xx only) CO_2 concentration (model 623xx only)
Screen Displays (waveform)	ECG – one line, or cascading to two lines, with 1 mV scale bar on first line SpO_2 Impedance Respiration (models 622xx and 623xx) $ETCO_2$ (model 623xx)
Numeric Displays	3-digit green LED: Pulse 3 digit red LED: Systolic 3 digit red LED: Diastolic 2-digit red LED: SpO_2% 4-digit green LED: Temperature (models 622xx and 623xx)
Trend Data	Date/Time, Heart Rate, Systolic, Diastolic, MAP, SpO_2 Respiration Rate, Temperature (models 622xx and 623xx) CO_2 concentration (model 623xx)
Trend Sampling	Sample at every BP cycle, or every 15 minutes
Trend Capacity	144 samples, maximum time span 36 hours
Power Voltage	100 to 240 VAC
Power Frequency	50 - 60 Hz
Power Current	1 A
Storage Temperature	-20° to 50° C
Storage Humidity	15 to 95% non-condensing
Storage Altitude	-170 to 1700 meters
Operating Temperature	10° to 40° C
Operating Humidity	15 to 90% non-condensing
Operating Altitude	-170 to 1700 meters
Equipment Type	Class 1 (model 621xx) Class 1, Internally powered (model 622xx, 623xx) Type CF Continuous operation
Moisture Resistance	IPX2 (IEC EN529)

Flammable Gases	Equipment not suitable for use in the presence of a Flammable Anesthetic Mixture.

A.2 SpO_2 - Nonin (all models) or Nellcor (optional Models 622xx & 623xx)

SpO_2 Range	40 to 100%
Measurement Method	Functional saturation
SpO_2 Accuracy	70 to 100%, ±2 digits (specified at 28° to 42° C sensor temperature)
Pulse Range	21 to 249 beats/minute
Pulse Accuracy	±3 beats/minute or 3%, whichever is greater
Plethysmograph	10 segments, vertical bar graph; proportional to pulse volume
Alarms	Low SpO_2 High and Low Pulse Rate (if ECG not active)
Alarm range	SpO_2: 60 to 99% Pulse Rate alarms use ECG Heart Rate settings when ECG not used
Audible signals (pulse tone)	Frequency tracks SpO_2 level Used alone, pulse tone tracks SpO_2 pulse Used with ECG, pulse tone tracks ECG Heart Rate
Audible volume (pulse tone)	8 levels including OFF
Update frequency – Nonin	Three times per second
Update frequency – Nellcor	Every heart beat
Sensor measurement wavelengths – Nellcor	Red: 660 nm, nominal; Infrared: 920 nm, nominal

A.3 NIBP

Systolic Range	60 to 250 mmHg
Diastolic Range	30 to 160 mmHg
Mean Arterial Pressure (MAP) Range	40 to 190 mmHg
Blood Pressure Accuracy	Per AAMI SP10-1992 Clause 4.4.2 Efficacy study results using Auscultatory Method as Reference Standard are available upon request.
Heart Rate Range for Specified Accuracy	40 to 200 beats/minute
Display	Numeric displays for Systolic, Diastolic and MAP Cuff pressure displayed during measurement cycle Data available in Trend display and printed report
Method	Oscillometric
Control	Manual and automatic control
Automatic Intervals	1, 3, 5, 10, 15, 30, and 60 minutes

Alarms	High and Low Systolic High and Low Diastolic High and Low MAP
Alarm Ranges	Systolic Low Limits: 60 – 245 mmHg Systolic High Limits: 65 – 250 mmHg Diastolic Low Limits: 30 – 150 mmHg Diastolic High Limits: 35 – 155 mmHg MAP Low Limits: 45 – 185 mmHg MAP High Limits 50 – 190 mmHg
Initial Cuff Pressure	120, 140, 160, 180, 200, 240, 280 mmHg - user selectable
Repeated Cuff Pressure	Previous Systolic pressure + 40 mmHg
Maximum Inflation Time	3 minutes (typical: <40 seconds)
Inflation Over-Pressure Dump	<300 mmHg
Inflation Over-Pressure Dump Backup	<330 mmHg

A.4 ECG

Heart Rate Range	21 to 249 beats/minute
Heart Rate Accuracy	±3 beats/minute or ±3% whichever is greater
Bandwidth, Normal Mode	0.5 to 40 Hz
Bandwidth, Extended Mode	0.05 to 100 Hz
Leads	3 wire or 5 wire, available in AHA or IEC colors
Connector	AAMI 6 pin
Electrodes	Disposable snap electrodes
Display Sweep Speeds	6.25, 12.5, 25 mm/second
Gain	10 mm/mV, and automatic gain with visual scale indicator
Scale Reference Bar	A fixed 1 mV reference bar is displayed with the top ECG waveform for scaling of the waveform. This is provided in place of a standardizing voltage.
Lead Display	Single, user selectable: I, II, III; or I, II, III, aVR, aVL, aVF, V
Heart Rate Display	Numeric
Waveform Display	One or two rows (cascading) of ECG waveform display
Leads Off Condition	Detected and displayed (selected lead only)
Alarms	High and Low Heart Rate
Alarm Ranges	Heart Rate Low Limits: 21 to 245 beats/minute Heart Rate High Limits: 25 to 249 beats/minute
Pulse Tone	Constant frequency, ECG used alone; Synchronized to SpO_2 pulse tone, ECG and SpO_2 used together, frequency varies with perfusion
Input Impedance	>2.5 Megohms at 10Hz

Input Protection	Defibrillator and Electrosurgery protected
Defibrillator Recovery per EC13:1992 Clause 3.1.2.1a)	<8 seconds
Impedance Respiration/Leads Off Detection Current per EC13:1992 Clause 3.1.2.1b)	50nA max for RA ,LA, LL, V; 200nA max for RL
Tall T Wave Rejection per EC13:1992 Clause 3.1.2.1c)	Rejects Tall T waves through 1.4 mV
Heart Rate Averaging Method per EC13:1992 Clause 3.1.2.1d)	Number of consecutively detected beats: >12: Heart rate = 60/(average of last 12 detected consecutive R-R intervals) <12: Heart rate = 60/(average of the detected consecutive R-R intervals)
Response to Change in Heart Rate per EC13:1992 Clause 3.1.2.1f)	Increasing from 80 to 120 beats/minute: 3 sec Decreasing from 80 to 40 beats/minute: 9 sec
Time to Alarm for Tachycardia per EC13:1992 Clause 3.1.2.1g)	Waveform 4(a) Amplitude: Average time to alarm: 0.5 mV 6.21 seconds 1.0 mV 50.2 seconds 2.0 mV 10.96 seconds Waveform 4(b) Amplitude: Average time to alarm: 1.0 mV 50.3 seconds 2.0 mV 12.06 seconds 4.0 mV 6.40 seconds
Pacemaker Display per EC13:1992 Clause 3.2.9.12	Pacemaker signals displayed as captured.
Pacemaker Rejection per EC13:1992 Clause 3.1.4.1	Rejects all specified pacemaker signals, including double paces, without over/undershoot. Exception: Ineffectively paced QRS pattern may cause a QRS to be rejected and not counted as a pulse when the pace occurs very close to the R wave.
Pacemaker Rejection per EC13:1992 Clause 3.1.4.2	Rejects all specified pacemaker signals, including double paces, with over/undershoot with the exception of ±2 mV amplitude, 0.1 ms duration, 0.5 mV overshoot, time constant=100

A.5 Printer (standard Model 623xx, optional Models 621xx & 622xx)

Printing method	Direct thermal
Printer type	Thermal array
Resolution	Vertical: 8 dots/mm (203 dots/inch) horizontal: 12 dots/mm (305 dots/inch)
Printing speed	25 mm/second
Chart position accuracy (dot to dot)	±5%

Effective print width	54 mm ± 0.2 mm
Paper capacity	100 foot roll of 58 mm paper, non printed grid
Paper loading	non-threading, drop-in from top of unit
Time scale	25 mm/second
Printout data	Waveform: 15 second record of ECG; lead selected, gain setting, time scale Waveform: 15 second record of selected second waveform Numeric: Systolic, Diastolic, MAP, $ETCO_2$, Respiration Rate, Temperature, Time and Date (as configured)
Print timing	Waveforms: 9 seconds prior to PRINT button press, 6 seconds after button press Numeric data captured at time of button press

A.6 Impedance Respiration (Models 622xx & 623xx)

Measurement Technique	Trans-thoracic impedance
Leads	RA to LA (Lead I)
Current	50 nA max
Range	5 to 100 breaths/minute
Accuracy	±3 breaths/minute
Alarms	High and Low Respiration Rate
Alarm Ranges	Respiration Low limits: 5 to 99 breaths/minute Respiration High limits: 6 to 100 breaths/minute
Waveform Display	One line Respiration waveform
Respiration Rate Display	Numeric
Display Sweep Speeds	3.125, 6.25, 12.5 mm/second

A.7 Temperature (Models 622xx & 623xx)

Range	17° to 50°C (62.6° to 122° F)
Accuracy	±0.2°F, ±0.1°C plus probe tolerance.
Resolution	±0.1°F or ±0.1°C
Compatibility	YSI 400 series probes
Alarms	None provided
Temperature Display	Numeric
Units	Fahrenheit or Centigrade

A.8 Backup Battery (Models 622xx & 623xx)

Type	Sealed Lead Acid (leak proof)
Duration	BP reading every 5 minutes; 15 second strip printed every 5 minutes: 1 hour (model 622xx) 45 minutes (model 623xx)
Charging	Automatic when AC power connected
Charge time	80% capacity: 5 hours 100% capacity: 24 hours
Alarms	Low battery Very low battery Depleted battery
Low Battery Alarm	10 minutes remaining; chime every 2 minutes and CRT message
Very Low Battery Alarm	5 minutes remaining; chime every minute and CRT message
Depleted Battery Alarm	1 minute remaining; trend data printed; continuous alarm and CRT message; system shut down, BP pressure released

A.9 I/O Communications (Models 622xx & 623xx)

Connector	RJ45 socket on rear of case
Nurse Call Signal	Normally open relay contacts from pins #1 and #8 of RJ45 connector. Contacts closed when any alarm is audible. Contacts rated for 1 A, 24 VAC.
Serial Interface	Bi-directional RS232; 9600 baud, 8 bit, 1 stop bit, no parity, no flow control
Protocols	Pangea SIO command interface Welch Allyn serial communications protocol

A.10 End Tidal CO_2 (Model 623xx)

Measurement Method	Sidestream
Measurement Range	0 to 98 mmHg Percentage and kPa conversions are based on current barometric pressure.

Measurement Accuracy	Ambient temperature 15ºC to 45ºC: 0 to 40 mmHg: ±3 mmHg; 41 to76mmHg: ±8% of reading; 77 to 99 mmHg: ±10% of reading. Ambient temperature 5ºC to 15ºC and 45ºC to 55ºC: 0 to 40 mmHg: ±4 mmHg; 41 to76mmHg: ±10% of reading; 77 to 99 mmHg: ±12% of reading. Accuracy unspecified for breath rates >30 breaths/minute.
Standard Conditions	Automatic compensation to comply with BTPS. BTPS CO_2 = (internal measurement) x 1.03
Breath Rate Range	5 to 100 breaths/minute
Breath Rate Accuracy	±1 breath/minute or ±5%, whichever is greater
Display Units	mmHg, %, kPa; user selectable
Resolution	1 mmHg
Alarms	High and Low CO_2 measurement High and Low Respiration Rate
Alarm Ranges	Low CO_2 Limits: 0 to 97 mmHg High CO_2 Limits: 1 to 98 mmHg Low Respiration Limits: 5 to 99 breaths/minute High Respiration Limits: 6 to 100 breaths/minute
Display Sweep Speed	3.125, 6.25, 12.5 mm/second
Start-up Time	<10 seconds to acquire waveform; <5 minutes to full operating specifications
Display	Waveform, Respiration Rate and CO_2 measurement displayed on CRT and printer
Interfering Gas Compensation: Nitrous Oxide or Oxygen Concentration Greater than 50% No automatic compensation provided, user must apply equations provided.	O_2 concentration >50%, no N_2O: Actual CO_2 = (displayed measurement) x 1.03 N_2O concentration >50%: Actual CO_2 = (displayed measurement) x 0.952
Stability	Unaffected by humidity or temperature within specified operating range; unaffected by moisture in sampled air
Rise Time	0.58 second rise time; 0.59 second fall time
Delay Time	5.4 seconds
Total System Response Time	5.99 seconds
Sound Pressure	Without tubing: 50.2 dB With tubing: 48 dB
Diversion Flow	Nominal 175 ml/minute
Adverse Effects of Testing per ISO 9918:1992 Clauses 50, 60, 61, 62; EN864:1997 Clauses 50, 101, 102, 103	System remains within specification

Adverse Effects of Electrocautery, Electrosurgery, Defibrillation, X-ray, IR, Conducted Transients, Magnetic Fields, RFI	Clinical Utility within 8 seconds of electrosurgery and defibrillation; Meets EN60601-1-2 for EMC and emissions; Not suitable for use in MRI

11 Appendix B: ElectroMagnetic Compatibility (EMC)

Electromagnetic Emissions
IEC 601-1-2

This Welch Allyn Atlas Monitor is suitable for use in the specified electromagnetic environment. The purchaser or user of the Welch Allyn Atlas Monitor should assure that it is used in an electromagnetic environment as described below:		
Emissions Test	Compliance	Electromagnetic Environment
Radiated and conducted RF emissions CISPR 11	Class A	This Welch Allyn Atlas Monitor is suitable for use in domestic establishments and in establishments directly connected to the low voltage power supply network which supplies buildings used for domestic purposes.
	Group 1	This Welch Allyn Atlas Monitor uses RF energy only for its internal function. Therefore, the RF emission is very low and not likely to cause any interference in nearby electronic equipment.
Harmonic emissions IEC 1000-3-2	Complies	This Welch Allyn Atlas Monitor is suitable for use in establishments directly connected to a public low voltage power supply network.
Voltage fluctuations/ flicker emissions IEC 1000-3-3	Complies	This Welch Allyn Atlas Monitor is suitable for use in establishments directly connector to a public low voltage power supply network.

Electromagnetic Immunity
IEC 601-1-2

This Welch Allyn Atlas Monitor is suitable for use in the specified electromagnetic environment. The purchaser or user of the Welch Allyn Atlas Monitor should assure that it is used in an electromagnetic environment as described below:

Immunity Test	IEC 601-1-2 Test level	Compliance level	Electromagnetic Environment
Electrostatic discharge (ESD) IEC 1000-4-2	6 kV contact 8 kV air	3	Floors are wood, concrete, or ceramic tile, or floors are covered with synthetic material and the relative humidity is at least 50 percent
Radiated RF IEC 1000-4-3 Conducted RF IEC 1000-4-6	Non-life-supporting equipment 3 V/m 80 MHz to 2 GHz All equipment 3 V 150 kHz to 80 MHz	3	Field strengths from fixed RF transmitters are less than 3 V/m, as determined by an electromagnetic site survey*. Portable and mobile RF communications equipment are used no closer to any part of the Welch Allyn Atlas Monitor, including cables, than the DISTANCE listed in the Recommended Separation Distances Table. For portable RF sources not listed, the DISTANCE can be estimated using Equations A or B, according to the frequency of the transmitter. Interference may occur in the vicinity of equipment marked with the following symbol:
Electrical fast transient/burst IEC 1000-4-4	2 kV for power supply lines 1 kV for input/output lines >3m	3	Mains power quality is that of a typical commercial and/or hospital environment.
Surge IEC 1000-4-5	1 kV differential mode 2 kV common mode	3	Mains power quality is that of a typical commercial and/or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 1000-4-11	0 % Un for 0.5 cycle 40 % Un for 5 cycles 70 % Un for 25 cycles 0% Un for 5 sec	3	Mains power quality is that of a typical commercial and/or hospital environment. If the user of the Welch Allyn Atlas Monitor requires CLINICAL UTILITY during power mains interruptions, it is recommended that the Welch Allyn Atlas Monitor be powered from an uninterruptible power supply.

Power frequency (50/60 Hz) magnetic field IEC 1000-4-8	10 A/m	3	Power frequency magnetic fields are at levels characteristic of a typical location in a typical commercial and/or hospital environment.
*Field strengths from fixed transmitters, such as cellular phone and land mobile base stations, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be estimated accurately. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be performed. If the measured field strength exceeds the RF compliance level above, observe the Welch Allyn Atlas Monitor to verify normal operation in each use location. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Welch Allyn Atlas Monitor, shielding the room in which the Welch Allyn Atlas Monitor is used, and/or adding filters to signal and/or power lines. Note: These are guidelines. Actual conditions may vary.			

Recommended Separation Distances
IEC 601-1-2

RF Source	Typical Rated Power (watts)	DISTANCE (meters)
Microcellular phone, CT1, CT2, CT3	10 mW	3
DECT cellular phone, wireless information technology equipment (modems, LANs)	250 mW	2
Cellular phone, hand-held (USA)	600 mW	2
Cellular phone, hand-held (e.g. GSM and NMT, Europe; DECS 1800)	2 8	4 7
Walkie-talkie (rescue, police, fire, maintenance)	5	3
Cellular phone, bag	16	10
Mobile radio (rescue, police, fire)	100	24

For transmitters using frequencies below 800 MHz, the DISTANCE can be estimated using Equation A:

$$d = \frac{3.5}{3}\sqrt{P} \qquad A)$$

For transmitters using frequencies between 800 MHz and 2 GHz, the DISTANCE can be estimated using Equation B.

$$d = \frac{7}{3}\sqrt{P} \qquad B)$$

Where P is the power rating of the transmitter in watts (W) according to the transmitter manufacturer.

12 Appendix C: Calibration and Maintenance

The Atlas Monitor must be serviced by authorized Welch Allyn personnel or agents at 6 month intervals. Maintenance requirements are specified for 6 month, 12 month and 24 month service intervals. The monthly CO_2 Reset operation can be performed by the user.

Service Interval	Maintenance Requirements
Every month	CO_2 Reset
Every 6 months	CO_2 Calibration Button test LED test Printer test
Every 12 months	All 6 month maintenance requirements BP Calibration ECG Calibration Battery test
Every 24 months	All 6 month maintenance requirements All 12 month maintenance requirements ECG signal gain & noise test Temperature measurement check with calibrated probe SpO_2 measurement check and functional tests

13 Appendix D: Accessories for the Welch Allyn Atlas Monitor

Part number	Description
Blood Pressure Accessories	
5200-01	Adult Cuff Assembly (cuff, latex-free bladder and connectors)
5200-02	Large Adult Cuff Assembly (cuff, latex-free bladder and connectors)
5200-03	Small Cuff Assembly (cuff, latex-free bladder and connectors)
5200-10	Extra-large Cuff Assembly (cuff, latex-free bladder and connectors)
5200-04	Adult Bladder (latex-free, includes connector)
5200-05	Large Adult Bladder (latex-free, includes connector)
5200-06	Small Bladder (latex-free, includes connector)
5200-11	Extra-large Adult Bladder (latex-free, includes connector)
5082-59	Adult Cuff
5082-61	Large Adult Cuff
5082-63	Small Cuff
5082-64	Extra-large Adult Cuff
5200-07	Coiled Pressure Hose (8 feet, latex-free)
5200-12	Straight Pressure Hose (8 feet, latex-free)
5200-08	Calibration "T" Connector
Nonin Pulse Oximetry Accessories	
5200-40	Finger Clip Sensor (Adult) with 9 foot cable
5200-56	Finger Clip Sensor (Pediatric) with 9 foot cable
5200-41	Ear Clip Sensor
5200-42	Flex Sensor
5200-44	Reflectance Sensor
5200-45	Reflectance Sensor Holder (box of 10)
5200-46	Adult Finger Flexiform Sensors (single use, box of 10)
5200-47	Pediatric Finger Flexiform Sensors (single use, box of 10)
5200-50	Sensor Attachment Tape
5200-51	Hydrogel Tape Strips
5200-52	Extension Cable (3 feet)
5200-54	Finger Clip Sensor with 3 foot cable
5200-55	Extension Cable (9 feet)
Nellcor Puritan Bennett Pulse Oximetry Accessories	
DS-100A	DURASENSOR Adult Oxygen Transducer
EC-8	Extension Cable (8 feet)
D-YS	DURA-Y Oxygen Transducer (1 sensor, 40 wraps)
D-YSE	Ear Clip (use with Dura-Y sensor)
D-YSPD	PediCheck Pediatric Spot Check (use with Dura-Y sensor)
D-25	OXISENSOR II Adult (single use, case of 24)
D-25L	OXISENSOR II Adult, long cable (single use, case of 24)
D-20	OXISENSOR II Pediatric (single use, case of 24)

I-20	OXISENSOR II Infant (single use, case of 24)
R-15	OXISENSOR Adult Nasal (case of 24)
OXICLIQ A	Adult Oxygen Transducer, use with OC-3 cable
OXICLIQ P	Pediatric Oxygen Transducer, use with OC-3 cable
OC-3	OxiCliq Sensor Cable
OXI - A/N	OXIBAND Adult/Neonatal Transducer (1 sensor, 50 wraps)
OXI - P/I	OXIBAND Pediatric/Infant Transducer (1 sensor, 50 wraps)
RS-10	Reflectance Oxygen Transducer (6 sensors, 6 headbands)
SRC-2	Portable Oximetry Tester
Power Cord Accessories	
5200-110	Line Cord (US / Canada / Japan version)
5200-111	Line Cord (European version)
5200-112	Line Cord (United Kingdom version)
5200-113	Line Cord (Australian version)
5200-114	Line Cord (Swiss version)
5200-115	Line Cord (South American version)
Mounting Accessories	
6200-30	Mobile Stand
6200-31	Wall Mount
Miscellaneous Accessory Items	
6200-40	Printer Paper – Case (25 rolls)
6200-41	Replacement battery
6200-42E	Operator Manual (English version)
6200-42F	Operator Manual (French version)
6200-42G	Operator Manual (German version)
6200-42S	Operator Manual (Spanish version)
6200-42I	Operator Manual (Italian version)
6200-42P	Operator Manual (Portuguese version)
6200-42C	Operator Manual (Chinese version)
6200-42J	Operator Manual (Japanese version)
6200-44	Inservice Training Videotape (English, NTSC version)
6200-43E	Technical Service Manual (English)
6200-45	Monitor Carrying Case
Thermometry Accessories	
6200-15	Temperature Probe-Surface
ECG Accessories	
6200-01	ECG Patient Cable (3 lead AHA)
6200-02	ECG Patient Cable (5 lead AHA)
6200-03	ECG Patient Cable (3 lead IEC)
6200-04	ECG Patient Cable (5 lead IEC)
6200-05	ECG Leads, 3 Lead (AHA)
6200-06	ECG Leads, 5 Lead (AHA)

6200-07	ECG Leads, 3 Lead (IEC)
6200-08	ECG Leads, 5 Lead (IEC)
6200-09	Disposable Electrodes (package of 3)
6200-10	Disposable Electrodes (package of 5)
6200-11	Disposable Electrodes (package of 30)
ETCO2 Accessories	
6200-20	ETCO2 Water Trap (package of 5)
6200-21	ETCO2 Scrubber
6200-22	ETCO2 Adult Nasal Sample Line
6200-23	ETCO2 Adult Nasal Sample Line (package of 10)

14 Appendix E: Troubleshooting

E.1 Diagnosing Atlas Monitor Problems

E.1.1 Blood Pressure

PROBLEM:
Blood pressure readings are inaccurate.
RECOMMENDED ACTIONS:
Squeeze all air out of cuff and repeat measurement.
Check the cuff for correct size for the patient – check that the index mark falls within the range markings.
Check the cuff for proper fit – there should be room to insert no more than two fingers between the deflated cuff and the patient's limb. A cuff applied too loosely may result in artificially high readings.
Check the cuff for proper alignment – there is a mark indicating where the cuff should align over the patient's brachial artery.
Check the patient:

The blood pressure should be taken on a bare arm.
Place patient with midpoint of upper arm at heart level. This is approximately at the mid-axillary line at the 4th intercostal space.
Have patient lie down.
Patient must be motionless. Excess movement, shivering, seizure could interfere with the measurement.
If the patient is sitting, the back and legs should be supported. The lower arm should be passively supported. i.e. sitting in patient's lap.
Unusual physiology, obesity, or poor circulation could be preventing Atlas Monitor from detecting the pulse.
Cardiac arrhythmia could interfere with the measurement.

Have the unit recalibrated.

PROBLEM:
Blood pressure cannot complete reading in 3 minutes.
RECOMMENDED ACTIONS:

- Safety mechanisms automatically abort blood pressure measurements when a reading has not been obtained within 3 minutes;

Check for leaks in tubing and cuff, and at connections.
Check the cuff for correct size for the patient – check that the index mark falls within the range markings.
Check the cuff for proper alignment – there is a mark indicating where the cuff should align over the patient's artery.
Check the patient:

Must be motionless. Excess movement, shivering, seizure could interfere with the measurement.
Unusual physiology, obesity, or poor circulation could be preventing Atlas Monitor from detecting the pulse.
Cardiac arrhythmia could interfere with the measurement.

Set **Initial pressure** higher if many repressurization steps are necessary due to high patient blood pressure.

PROBLEM:
Blood pressure automatic timing stops.
RECOMMENDED ACTIONS:

- Safety mechanisms automatically stop the timed blood pressure measurements when the Atlas Monitor repeatedly fails to make a measurement within 3 minutes;

Determine the reason that the measurements are failing and restart the timed cycle. Press **BP Start/Cancel** to manually start a measurement; **Auto** timing will resume.

E.1.2 CO_2

PROBLEM:
Pump does not start.
RECOMMENDED ACTIONS:
Watertrap not fully inserted.
CO_2 not selected as **Second trace selection** in Advanced Configuration menu.

PROBLEM:
Display does not start - waveform, Respiration Rate, CO_2 not displayed.
RECOMMENDED ACTIONS:
Watertrap not fully inserted.
CO_2 not selected as **Second trace selection** in Advanced Configuration menu.

PROBLEM:
Long delay in starting/stabilizing waveform display or numeric displays.
RECOMMENDED ACTIONS:

- CO_2 function is specified to begin display within 10 seconds, but not to reach full specification for up to 5 minutes.

Restriction in sampling tubing.
Poor placement of nasal cannula in patient's nose.
Patient breathing orally.
Patient breathing very shallowly.

PROBLEM:
CO_2 readings inaccurate.
RECOMMENDED ACTIONS:
Pressure or suction being applied to sampling tubing – check for flow interference from ventilation, oxygen, anesthetic supplies.
High concentration of oxygen or nitrous oxide requires compensation calculation – see Appendix A: Technical Specifications for the Atlas Monitor.
Poor placement of nasal cannula in patient's nose.
Patient breathing orally.
Patient breathing very shallowly.

CO_2 exhaust port on rear of unit blocked or obstructed.
Have the unit recalibrated.

PROBLEM:
CO_2 pump sounds change – speeding up, slowing down.
RECOMMENDED ACTIONS:
Flow restrictions or leaks in tubing.
CO_2 exhaust port on rear of unit blocked or obstructed.

E.1.3 Displays

PROBLEM:
CRT display is misaligned, twisted, or tilted.
RECOMMENDED ACTIONS:
Have CRT mounting adjusted by Service.

PROBLEM:
Extraneous marks on CRT display – extra lines, overlapping numbers.
RECOMMENDED ACTIONS:
Turn the power off and back on; this will clear the display.

PROBLEM:
An LED segment/display is not functioning.
RECOMMENDED ACTIONS:
Have unit repaired.

E.1.4 ECG

PROBLEM:
ECG waveform baseline is drifting on screen.
RECOMMENDED ACTIONS:
Change **ECG Bandwidth** from **Extended** to **Monitor** in Advanced Configuration menu.
Check connections:
- ECG trunk cable at Atlas Monitor socket.
- ECG leads at trunk cable.
- ECG leads at electrodes.

Check for proper placement of electrodes on patient.
Check for good contact of electrodes to patient – shave, clean if necessary.
Minimize patient motion.

PROBLEM:
Heart Rate is not being displayed by ECG.
RECOMMENDED ACTIONS:
If ECG waveform is displayed:

Wait 20 seconds for heart rate to be determined and displayed.
Select different leads for display (wait 20 seconds after selecting). Some leads may sense QRS complexes that have too low of an amplitude for the Heart Rate detection circuit.
Evaluate ECG waveform – excess noise, low QRS amplitude, arrhythmia could interfere with determining stable heart rate.

If ECG waveform is not displayed:

Check connections:
ECG trunk cable at Atlas Monitor socket.
ECG leads at trunk cable.
ECG leads at electrodes.
Check for proper placement of electrodes on patient.
Check for good contact of electrodes to patient – shave, clean if necessary.

PROBLEM:
ECG waveform is noisy or erratic.
RECOMMENDED ACTIONS:
Change **ECG Bandwidth** from **Extended** to **Monitor** in Advanced Configuration menu.
Change **ECG Gain** to **Automatic** in Advanced Configuration menu.
If using a 3 wire lead set, ensure that **ECG lead set** is set to **3 wire** in Advanced Configuration menu.
Check connections:

ECG trunk cable at Atlas Monitor socket.
ECG leads at trunk cable.
ECG leads at electrodes.
Check for proper placement of electrodes on patient.
Check for good contact of electrodes to patient – shave, clean if necessary.

Eliminate patient movement.
Move ECG cables away from other equipment and possible interference sources.
Evaluate interference sources:

Models 622xx, 623xx – unplug AC and run on battery power to determine whether interference is from power line.
Move RFI sources and radio transmitters away from Atlas – see **Appendix B: ElectroMagnetic Compatibility (EMC)** for recommended separation distances.
Turn off fluorescent lights.

PROBLEM:
ECG Leads Off fault not reported.
RECOMMENDED ACTIONS:
ECG Leads Off is only detected and reported on the Lead that is currently being monitored.

PROBLEM:
ECG waveform, heart rate corrupted by Electrosurgery or Electrocautery.

RECOMMENDED ACTIONS:

- Monitor is specified to return to Clinical Utility within 8 seconds of discontinuance of electrosurgery; Heart Rate display may require up to 20 seconds to stabilize.

Verify that electrosurgery neutral (return) line is making good contact with patient.
Route ECG cables as far as possible from electrosurgery site and neutral line.

PROBLEM:
ECG Heart Rate significantly differs from SpO_2 pulse rate.
RECOMMENDED ACTIONS:
ECG heart rate may be inaccurate due to arrhythmia, cabling problems.
SpO2 pulse rate may be inaccurate due to poor perfusion, poor blood flow to limb, light interfering with sensor, patient movement.
Manually measure pulse by arterial palpation to determine which instrument is reading incorrectly and troubleshoot that instrument further.

PROBLEM:
Pacemaker signals not visible on ECG trace.
RECOMMENDED ACTIONS:

- Pacemaker signals are displayed as captured; the Atlas Monitor does not have an option to present symbolic indication of pacemaker signals;

Change **ECG Bandwidth** to **Extended** in Advanced Configuration menu.
Change **ECG Gain** to **Automatic** in Advanced Configuration menu.

PROBLEM:
Heart Rate inaccurate on pacemaker patient.
RECOMMENDED ACTIONS:
Certain unusual artifacts of pacemaker signals may be counted as pulse signals. Connect SpO_2 sensor and monitor displayed Pulse rate as an adjunct measurement.
In patients with pacemakers that are not successfully capturing the pulse, certain timing interactions between pace signal and pulse can cause an occasional additional pulse beat to be counted.

E.1.5 Impedance Respiration

PROBLEM:
Cannot detect impedance respiration.
RECOMMENDED ACTIONS:
Move leads to mid-axillary positions as shown in Connecting the ECG Electrodes.
Check connections:

ECG trunk cable at Atlas Monitor socket.
ECG leads at trunk cable.
ECG leads at electrodes.
Check for good contact of electrodes to patient – shave, clean if necessary.

E.1.6 Power

PROBLEM:
AC~ indicator not lit.
RECOMMENDED ACTIONS:

- Atlas Monitor is specified to operate on any voltage from 100 to 240, and on 50 or 60 Hz – verify that the service provided meets these requirements;

Check proper connection of AC cord in Atlas Monitor appliance socket.
Check proper connection of AC cord in wall outlet.
Check proper power cord for local outlet standards.
Check for tripped fuse or circuit breaker in AC service.
If no problems are found, have the unit repaired.

PROBLEM:
Battery life is too short.
RECOMMENDED ACTIONS:

- Model 622xx is specified for 1 hour of battery life when operating ECG, SpO_2, Temperature, and blood pressure, with one blood pressure measurement every 5 minutes, and one printout every 30 minutes;
- Model 623xx is specified for 45 minutes of battery life when operating ECG, SpO_2, Temperature, CO_2, and blood pressure with one blood pressure measurement every 5 minutes, and one printout every 30 minutes;
- Battery charge time is specified as 24 hours to full charge, 5 hours to 80% charge;
- Battery charging occurs whenever unit is plugged in to AC power, whether it is operating or not;

Leave the Atlas Monitor plugged into AC power overnight and whenever the unit is not in use.
Reduce the frequency of blood pressure measurements or printouts if practical.
Charge Atlas for 24 hours and time battery life in use as specified above; if less than the specified battery life is provided, unit must be repaired.

E.1.7 Printer

PROBLEM:
Printer does not print
RECOMMENDED ACTIONS:
If paper is not feeding out of printer:

Check that paper is installed with end of paper extending beyond door slot.
Check that printer door is closed.
Check for paper scraps jamming in roller and gears in printer door.
Have unit repaired.

If paper is feeding out of printer, but it is blank:

Check that thermal side of paper faces the front of the Atlas Monitor.
Replace paper with a new roll (preferably with a known good partial roll).

Check that the printer door is fully closed and latched.
Have unit repaired.

PROBLEM:
Printing too light / too dark.
RECOMMENDED ACTIONS:
Replace paper with a new roll.
Have unit repaired.

PROBLEM:
Printing blurred.
RECOMMENDED ACTIONS:
Check that printer door is properly closed.
Replace paper with a new roll.
Have unit repaired.

E.1.8 Sounds

PROBLEM:
Pulse or alarm sounds are too loud or too quiet when unit is turned on.
RECOMMENDED ACTIONS:
Sound levels can be changed and then set as default values – see section: Managing the Alarms

PROBLEM:
No pulse tone.
RECOMMENDED ACTIONS:
Check default volume setting for pulse tone – see section: Managing the Alarms.
Press SpO_2 volume up button several times.

If SpO_2 is not active and ECG is active:

- Pulse tone will not sound until a stable Heart Rate is measured and displayed by ECG – this can take up to 20 seconds;

If Heart Rate is displayed, have unit repaired.

If SpO_2 is active and ECG is active:

- Pulse tone will not sound until a stable heart rate is measured and displayed by ECG – this can take up to 20 seconds;

If Heart Rate is displayed, have unit repaired.

If SpO_2 is active and ECG is not active:
If Pulse measurement is displayed, have unit repaired.

E.1.9 SpO_2

PROBLEM:
No SpO_2 reading or plethysmograph display.
RECOMMENDED ACTIONS:
Check whether the correct brand (Nellcor or Nonin) sensor is installed in the Atlas Monitor. The Atlas Monitor is equipped with one or the other, and the two brands of sensors are not interchangeable. Refer to your Atlas Monitor model number to determine which SpO_2 system you have.
Check connection of SpO_2 cable to monitor.
Check connection of SpO_2 sensor to extension cable.
Check patient: see section Connecting the SpO2 Fingerclip Sensor

E.1.10 Temperature

PROBLEM:
Temperature display is blank
RECOMMENDED ACTIONS:
No temperature probe has been detected: check connection at Atlas Monitor front panel.

PROBLEM:
Temperature display is inaccurate
RECOMMENDED ACTIONS:
Skin probe:
Verify proper placement on patient.
Eliminate drafts or other airflow near probe – cover with tape.
Oral, rectal, skin probe:
Replace probe.
Have unit repaired.

E.2 Atlas Monitor Error Messages

MESSAGE:
Altitude too high - CO_2 unavailable
Altitude too low - CO_2 unavailable
MEANING:
The ambient barometric pressure is too high or low for Atlas Monitor $ETCO_2$ functions.
RECOMMENDED ACTIONS:
If you are not above 1700 meters, or below 170 meters below sea level, this indicates a failure or calibration error in the Atlas Monitor barometric sensing system. The unit must be repaired.

MESSAGE:
Battery depleted - shutdown imminent

MEANING:
The battery (models 622xx and 623xx) is drained. The system will shut down within one minute.
RECOMMENDED ACTIONS:
If you have AC power available, plug in the Atlas Monitor. The battery will recharge automatically, whether the Atlas Monitor is turned on or off. The battery will return to 80% charge within 5 hours, and full charge within 24 hours. You will see the **AC~** symbol lit above the ECG cable connection.
When operating on battery power, you can extend the battery life by reducing the number of Blood Pressure measurements and printouts.

MESSAGE:
Battery is missing
MEANING:
The Atlas Monitor cannot detect the battery (models 622xx and 623xx). It has been removed, or there has been a failure of the battery or its connections.
RECOMMENDED ACTIONS:
The battery is not user serviceable. The unit must be repaired.
You can still operate the Atlas Monitor on AC power if available.

MESSAGE:
Blood pressure failure, service required
MEANING:
Atlas Monitor has detected a malfunction of the Blood Pressure system.
RECOMMENDED ACTIONS:
A mechanical or electrical fault has been detected in the Blood Pressure system. Remove the Atlas Monitor from service. The unit must be repaired.

MESSAGE:
Check blood pressure cuff
MEANING:
The Atlas Monitor has detected a problem in making a Blood Pressure measurement. No internal problem is detected. Either the Atlas Monitor could not detect a pulse, could not bring the cuff to the required pressure, or detected an overpressure condition. There may also be a problem that prevented the Atlas Monitor from completing a measurement within 3 minutes of the start of the measurement.
RECOMMENDED ACTIONS:
Check the tubing for kinks, crimps, or constrictions.
Check the tubing for leaks at the Atlas Monitor connection, and at the cuff connection.
Check the cuff for leaks.
Check the cuff for correct size for the patient – check that the index mark falls within the range markings.
Check the cuff for proper fit – there should be room to insert two fingers between the deflated cuff and the patient's limb.
Check the cuff for proper alignment – there is a mark indicating where the cuff should align over the patient's brachial artery.
Check the patient – must be motionless. Excess movement, shivering, seizure could interfere with the measurement.
Check the patient – unusual physiology, obesity, or poor circulation could be preventing Atlas Monitor from detecting the pulse.

MESSAGE:

Clock battery is dead - service required

MEANING:

There is a lithium battery inside the Atlas Monitor model 621xx that runs the time-of-day clock. It has lost power and the Atlas Monitor is no longer able to maintain its time settings. In models 622xx and 623xx, the rechargeable battery runs the clock, and it is depleted.

RECOMMENDED ACTIONS:

The model 621xx lithium battery is not user serviceable, and the unit must be repaired. The models 622xx and 623xx batteries can be recharged by plugging the system into AC power for 5 to 24 hours.

MESSAGE:

Clock not set

MEANING:

The time-of-day clock and calendar has not been set.

RECOMMENDED ACTIONS:

Press the **Date/Time** button to access the Set Date and Time menu. Use the **Select** and **Set** buttons to set the correct date and time.

MESSAGE:

CO_2 cannula or hose occluded

MEANING:

The CO_2 system has detected a flow restriction in its intake.

RECOMMENDED ACTIONS:

Check the tubing for kinks, bends, or blockage.
Check the patient's nasal cannula for blockage.
Replace the watertrap.

MESSAGE:

CO_2 failure, service required

MEANING:

The Atlas Monitor has detected a malfunction of the CO_2 system.

RECOMMENDED ACTIONS:

A mechanical or electrical fault has been detected in the CO_2 system. Remove the Atlas Monitor from service. The unit must be repaired.

MESSAGE:

CO_2 Reset Failed

MEANING:

When performing a CO_2 Reset operation, the Atlas Monitor samples CO_2-free air through the Scrubber, to use as a baseline reference. This reset operation has failed.

RECOMMENDED ACTIONS:

Turn the Atlas Monitor off and back on, and retry the CO_2 Reset operation. Repeat several times if necessary. If repeated attempts fail, then the unit must be repaired.

MESSAGE:

CO_2 reset recommended

MEANING:

The Atlas Monitor has determined that the baseline (no CO_2) setting should be verified by performing a CO_2 Reset procedure. The Atlas Monitor will recommend a CO_2 Reset operation about once per month.

RECOMMENDED ACTIONS:

At a convenient time, perform a CO_2 Reset procedure using the CO_2 Scrubber included with your model 623xx. The CO_2 system is safe to use in the interim before you perform the reset.

MESSAGE:

CO_2 watertrap not detected

MEANING:

The Atlas Monitor has CO_2 selected as the **Second trace selection**, has been monitoring CO_2, and can now no longer detect the watertrap. This message will not occur unless the Atlas Monitor has been successfully monitoring CO_2 and has subsequently lost contact with the watertrap.

RECOMMENDED ACTIONS:

Check to see that the watertrap is firmly inserted in its socket. You will hear the CO_2 pump start when the watertrap is properly inserted.

If the CO_2 pump does not start when the watertrap is inserted, there is a failure in the circuitry that detects the watertrap. The unit must be repaired.

MESSAGE:

Configuration lost - Factory default settings are active

MEANING:

A problem has occurred with the internal memory of the Atlas Monitor. The Patient Alarm settings that were saved have been lost, and the Patient Alarms are set back to the factory default settings. Advanced Configuration settings and volume settings may also have been reset to factory defaults.

RECOMMENDED ACTIONS:

Change the alarm limit settings and volume settings back to your preferences. Check the Advanced Configuration menu settings and change them to your preferences. Save your settings. Return to the waveform screen, and turn off the power. Turn the power back on. Your settings should remain, and you should not see the error message again. It is now safe to return the Atlas Monitor to use.

If you see the error message again when you turn on the power, it indicates an internal problem with the Atlas Monitor. The unit must be removed from service and repaired.

MESSAGE:

ECG failure, service required

MEANING:

The Atlas Monitor has detected a malfunction of the ECG system.

RECOMMENDED ACTIONS:

An electrical fault has been detected in the ECG system. Remove the Atlas Monitor from service. The unit must be repaired.

MESSAGE:

ECG lead fault

MEANING:

Atlas Monitor has detected a problem with the ECG leads. A signal cannot be properly detected.
Note that Atlas Monitor only reports lead faults on the lead that is currently selected by the Lead Select button (and indicated in the upper right corner of the screen).

RECOMMENDED ACTIONS:

Check the ECG cable connection on the front of the Atlas Monitor.
Check the connections of the individual ECG leads where they attach to the ECG trunk cable. Verify that the correct leads are plugged into the correct sockets. Make sure that you are not confusing AHA and IEC lead color schemes.
Check the attachment of the leads to the snap electrodes.
Check the attachment of the electrodes to the patient. Check for good contact. Shave hair or clean skin if necessary.
Check the proper placement of the electrodes on the patient.

MESSAGE:

Low battery power - shutdown in less than 10 minutes
Low battery power - shutdown in less than 5 minutes

MEANING:

The battery is running down. You have the indicated amount of time before the system shuts down. You will hear a chime once per minute (once per two minutes until 5 minutes remain) to remind you that you are low on power.

RECOMMENDED ACTIONS:

If you have AC power available, plug in the Atlas Monitor. The battery will recharge automatically, whether the Atlas Monitor is turned on or off. The battery will return to 80% charge within 5 hours, and full charge within 24 hours. You will see the **AC~** symbol lit above the ECG cable connection.
When operating on battery power, you can extend the battery life by reducing the number of Blood Pressure measurements and printouts.

MESSAGE:

Memory failure, service required

MEANING:

A problem has occurred with the internal memory of the Atlas Monitor.

RECOMMENDED ACTIONS:

Remove the Atlas Monitor from service. The unit must be repaired.

MESSAGE:

Power interrupted - settings lost

MEANING:

The Atlas Monitor model 621xx was unplugged from AC power without being turned off using the **Power On/Standby** button first; or there was a power failure. The changes in settings that you made such as alarm limits and Advanced Configuration settings may not have been saved.
This error should not occur on models 622xx or 623xx due to the built-in battery.

RECOMMENDED ACTIONS:

Review and correct the settings that you want to change. If you want the Alarm settings and volume settings to become permanent changes, perform a Save Alarm Settings procedure – see section: Managing the Alarms.
The technical alarm sounds when the system is first powered back on after the power interruption, and the alarm will be silenced by pressing any button on the Atlas Monitor.

MESSAGE:

Room too cold - CO_2 unavailable

Room too warm - CO_2 unavailable

MEANING:

The ambient temperature is too high or low for Atlas Monitor $ETCO_2$ functions.

RECOMMENDED ACTIONS:

If you are not above 40º C, or below 10º C, this indicates a failure or calibration error in the Atlas Monitor temperature sensing system. The unit must be repaired.

MESSAGE:

SpO_2 cable not detected

MEANING:

Atlas Monitor has lost communication with the SpO_2 cable and sensor.

RECOMMENDED ACTIONS:

Check the connection where the SpO_2 cable attaches to the Atlas Monitor.
Check the connection between the SpO_2 extension cord and the SpO_2 sensor, if used.
Check the connection between the SpO_2 sensor and the SpO_2 cable.
Replace the SpO_2 sensor and cable.
If none of these solves the problem, the unit must be repaired.

MESSAGE:

SpO_2 cuff not detected

MEANING:

Atlas Monitor has lost the pulse signal from the SpO_2 sensor. The Atlas Monitor can still detect that the sensor and cable are attached, but does not detect a patient's pulse.

RECOMMENDED ACTIONS:

Check attachment of sensor to patient.
Block ambient light infiltration into sensor – cover with gauze or other opaque material.
Check for health and condition of sensor attachment point.
Move sensor to a new attachment point.
Check patient for physiological problems – anoxia, anemia, defective hemoglobin, poor peripheral circulation, restricted blood flow to limb.
Check fingernail for polish or other coverage that may block sensors ability to acquire measurement.
Check that blood pressure cuff is not on the same limb as the SpO_2 sensor.
Replace SpO_2 sensor and cable.

If none of these solves the problem, the unit must be repaired.

MESSAGE:

SpO_2 failure, service required

MEANING:

Atlas Monitor has detected a malfunction of the SpO_2 system.

RECOMMENDED ACTIONS:

An electrical fault has been detected in the SpO_2 system. Remove the Atlas Monitor from service. The unit must be repaired.

MESSAGE:

Temperature failure, service required

MEANING:

Atlas Monitor has detected a malfunction of the Temperature measurement system.

RECOMMENDED ACTIONS:

An electrical fault has been detected in the Temperature system. You can continue to use the Atlas Monitor until it is convenient to perform repairs, if it acceptable to operate without Temperature sensing. The unit must be repaired.

MESSAGE:

Unexpected forward flow - CO_2 unavailable

Unexpected reverse flow - CO_2 unavailable

MEANING:

The CO_2 system has detected an unacceptable level of airflow that is overpowering the flow requirements of the CO_2 pump system.

RECOMMENDED ACTIONS:

Check that the CO_2 tubing is connected as a Sidestream sample. Mainstream sampling is not supported on Atlas Monitor.

Check that there is no pressure or vacuum source connected to the CO_2 tubing.

Check that there is no pressure or vacuum source connected to the CO_2 exhaust outlet on the rear of the Atlas Monitor.

15 Index

1

10 mm/mV gain, 15, 55

3

3 wire, 2-13, 15, 45, 46, 54, 55, 59

5

5 wire, 2-13, 15, 45, 46, 54, 55

A

AC~, 2
accessories, iv, vi, vii, 49, 59
Advanced Configuration, 4, 6, 8, 10, 13, 15, 16, 18, 20, 23, 29, 34, 42, 45, 47, 49, 51, 7-52, 53, 54, 55, 78, 79, 80, 81, 87, 89
alarms, 2, 4, 6, 8, 10, 11, 13, 16, 18, 20, 22, 23, 26, 28, 29, 38, 55, 59
arrhythmia, 77, 80, 81
Auto, 6, 32, 42
autoclave, vii
automatic gain, 15, 55, 63

B

bandwidth, 15, 34, 55
battery, 22, 30, 51
Battery, 2, 30
Battery Low Alarm, 22
biohazard, vii
blood pressure, iv, 1, 2, 6, 28, 30, 32, 40, 42, 43, 55, 57, 59
BP ALARMS Off, 6, 8, 10, 13, 16, 20, 28
BP Start/Cancel, 6, 32, 42

C

cannula, 50, 6-50, 59, 78, 86
Caution, v, vii, 38
Celsius, 49, 55
cleaning, vii, 57
CO_2, iv, vii, 2, 8, 13, 16, 17, 20, 21, 23, 26, 28, 50, 50, 51, 54, 55, 57, 59, 66, 78
cuff sizes, 40
cuffs, 1, 40, 43

D

Date and Time, 51, 52, 57, 59
Date/Time, 8, 15, 16, 18, 45, 49, 51, 52, 53, 57, 59
defibrillation, vi
Defibrillator, v, 64
Diastolic, 2, 6, 7, 11, 23, 26, 42, 55
disinfecting, vii

E

ECG, iv, vi, 1, 2, 8, 10, 11, 13, 14, 15, 16, 17, 20, 28, 34, 38, 45, 46, 54, 55, 59, 63, 81
ECG bandwidth, 15, 34, 54
ECG **gain**, 15, 54, 55
ECG lead set, 15, 45, 54
ECG speed, 15, 54, 55
$ETCO_2$, 2, 16, 20, 21, 23, 26, 28, 38, 50, 57
Extended, 15, 34, 54, 55

F

Factory Default, 27
Fahrenheit, 49, 55
Freeze, 3, 4, 34, 51

G

ground, vi

H

Heart Rate, 2, 8, 13, 17, 21, 23, 26
HR ALARMS Off, 28

I

Impedance Respiration, vi, 2, 16, 17, 20, 45, 55, 61, 64, 65, 81
Initial pressure, 6, 54, 55
Instrument Problem Alarm, 22, 29, 30
Interference, **45**
isolation, iv

L

Language, 54, 55
Lead Select, 13, 45, 51

M

MAP, 2, 8, 9, 13, 17, 21, 23, 26, 42, 54, 55
Mean Arterial Pressure, 8, 42, 55
Measurement Invalid Alarm, 22, 28
Monitor, 15, 34, 54, 55

N

Note, v, vii, 4, 6, 8, 10, 15, 18, 20, 22, 23, 26, 30, 32, 34, 36, 42, 43, 49, 50, 51, 71, 88
Nurse call, 22

O

oximetry, iv, 10, 13, 28, 43

P

Pacemaker, 15, 64, 81
PACEMAKER, vi
pacemakers, vi
Patient Alarm, 22, 24, 26
Plethysmograph, 10, 43
Power failure, 29
Power On/Standby, 2
Print, 2, 3, 4, 32, 34, 51
printer, 2, 3, 4, 34, 36, 51, 59
Printer paper, 36
Printing, 2, 4, 30, 32, 34
Pulse, 2, 10, 11, 23, 26, 43

R

Recharging, 30
RESP ALARMS Off, 28, 51, 57, 59
Respiration Rate, 16, 20, 23, 26
Respiration speed, 55

S

Safety, iv
Saving volume settings, 22
scrubber, 59
Scrubber, 57, 59, 60, 86, 87
Second trace selection, 54, 55
Select, 4, 7, 8, 11, 12, 13, 15, 16, 17, 18, 21, 22, 23, 26, 27, 40, 45, 49, 51, 57, 59
Set, 2, 4, 7, 8, 11, 13, 15, 16, 17, 18, 21, 26, 32, 45, 49, 51, 52, 52, 57, 59
Setting alarm limits, 7, 8, 11, 13, 17, 21
Sidestream, vii
Silence, 2, 4, 6, 8, 10, 11, 13, 16, 20, 22, 23, 24, 26, 28, 29, 54, 55
skin, vi, 10, 18, 43, 45, 49
spill, vii, 59
SpO_2, 1, 7, 10, 11, 16, 20, 23, 26, 28, 38, 40, 43, 44, 54, 55, 57, 59, 62, 84
Sterilize, vii
suspend, 2, 4, 6, 8, 10, 11, 13, 16, 20, 22, 23, 26, 27, 28
Systolic, 2, 6, 7, 11, 23, 26, 42, 55

T

Temperature, 2, 18, 19, 24, 28, 49, 54, 55, 65
Trend, 2, 4, 6, 8, 15, 16, 18, 23, 32, 33, 34, 45, 49, 51, 53

V

V-Lead Placement, 47
Volume, 22

W

Warning, v, vi, 40, 43, 57, 59
Watertrap, vii, 21, 28, 50, 57, 59
waveforms, 2, 4, 13, 34, 55

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